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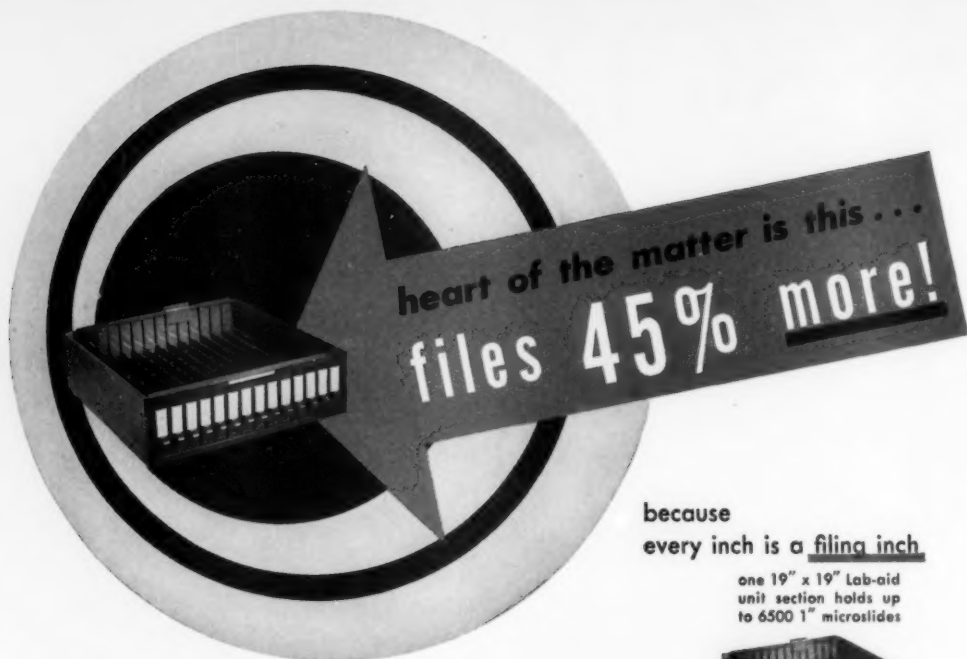
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# SCIENCE

2 December 1955

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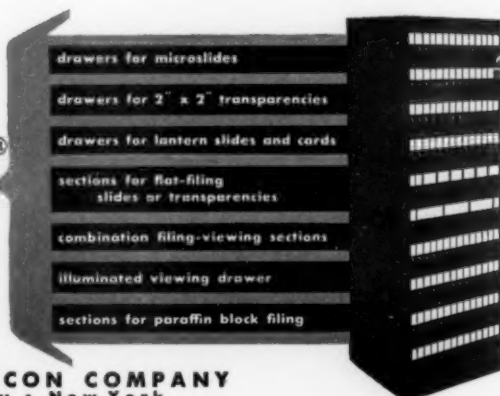
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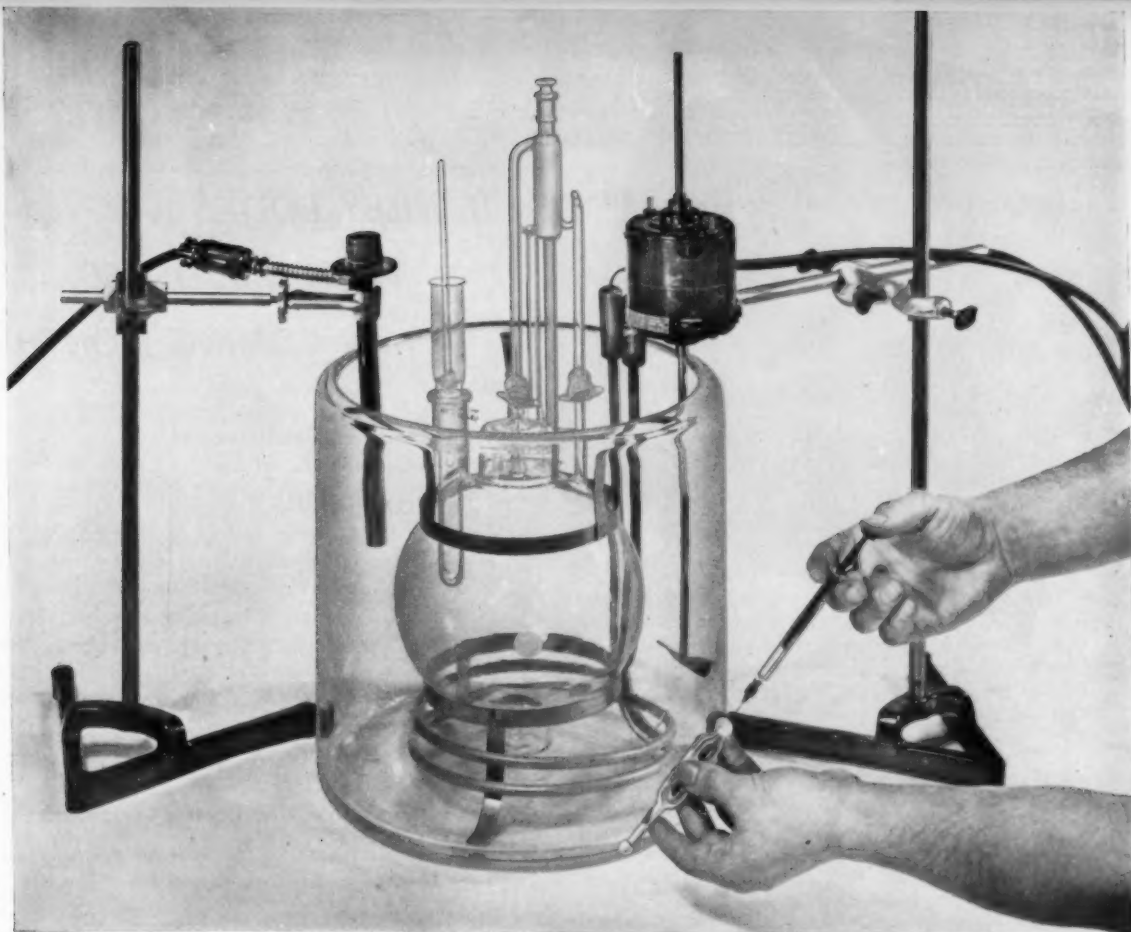
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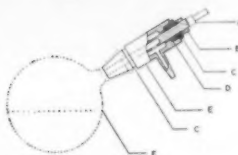
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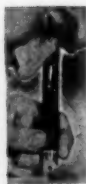
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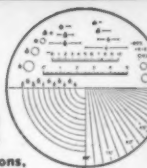
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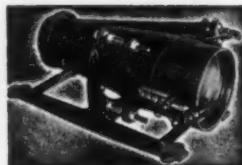
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*By H. C. Schaefer, Director, Laboratory Chow Research*

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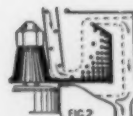
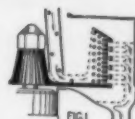
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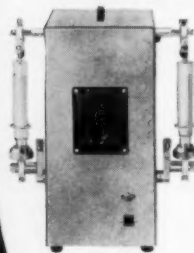
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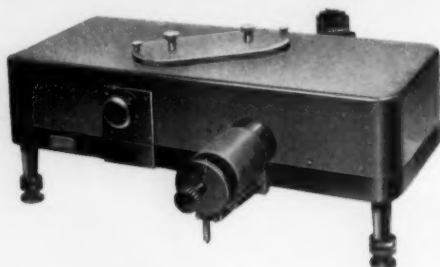
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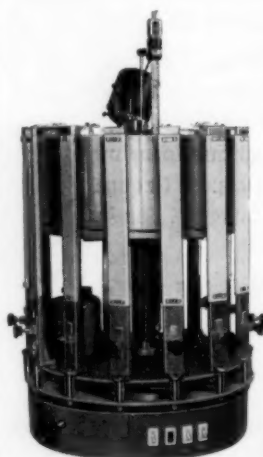
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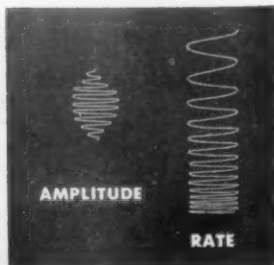


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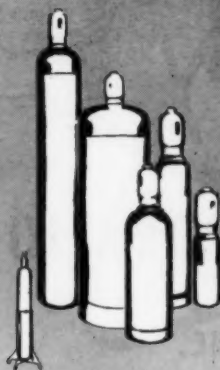
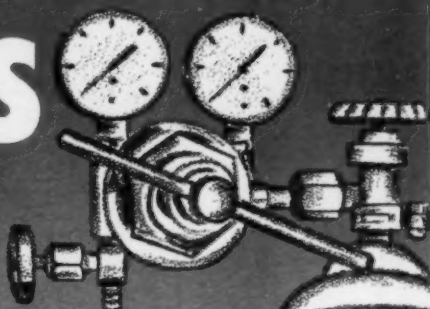


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## Commission on Security

Chief Justice Earl Warren has recently joined the ranks of prominent critics of the nation's security system. Pointing out in the November 1955 issue of *Fortune* that more than 8 million persons in the United States are subject to security procedures he warned: "In the present struggle between our world and Communism the temptation to imitate totalitarian security methods is a subtle temptation that must be resisted day by day, for it will be with us as long as totalitarianism itself."

Shortly after the appearance of Warren's article, the Civil Service Commission announced that 2778 federal employees had been dismissed for security reasons between 1 October 1953 and 30 June 1955. Unlike earlier reports, the latest figure was accompanied by the further information that only 413 of the dismissed employees had had hearings and that an additional 347 employees had been cleared following formal hearings. Past reports have been difficult to interpret, and their vagueness has frequently seemed less intended to convey accurate information than to create the impression of great effectiveness in ferreting out large numbers of potentially dangerous employees. The more detailed figures of the recent report are valuable in indicating that in only a seventh of the cases listed as "dismissed for security reasons" did the evidence undergo the scrutiny it gets in a security hearing, and that in close to half of the cases in which hearings were held the employee was cleared of the charges brought against him.

The more and more widely held belief that the security system should have a thorough examination led to the adoption by the Congress last spring of a resolution creating a 12-member national commission on security, with four members each to be appointed by the President, the Vice President, and the Speaker of the House of Representatives. Not until 10 November were the appointments announced: James P. McGrannery, Attorney General in the Truman Administration; Franklin D. Murphy, chancellor of the University of Kansas; Louis S. Rothschild, Under-secretary of Commerce; Carter L. Burgess, Assistant Secretary of Defense; Senators John Stennis and Norris Cotton; Lloyd Wright, past president of the American Bar Association; Susan Riley, professor of education at George Peabody College; Representatives Francis E. Walter and William L. McCulloch; James L. Noel, Jr., a Houston (Texas) attorney; and Edwin L. Mechem, former governor of New Mexico.

The appointments were immediately criticized for not including anyone who had distinguished himself in the field of civil liberties and for including too many persons who have been or still are responsible for administering government security procedures. One of the critics, the *Washington Post and Times Herald*, added editorially that "disappointment over the composition of the new commission ought not to result in prejudgment of its work. . . . If the members come to the same conclusion that experts who have studied the program already have come to—that the excesses have been defeating the purposes—the findings will carry additional weight because of the makeup of the commission itself."—D.W.



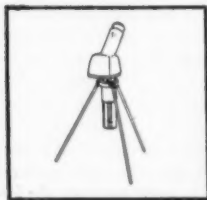
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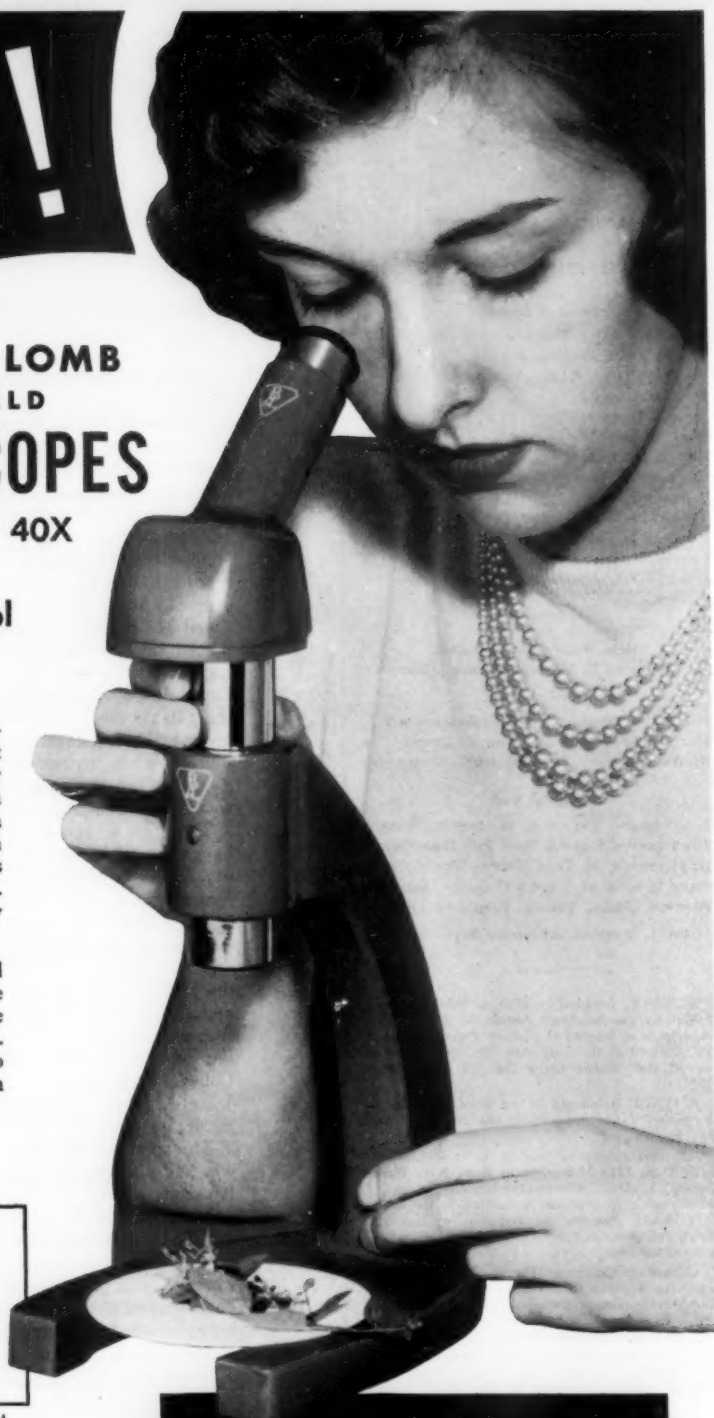
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## Preview of AAAS Meeting, Atlanta

Raymond L. Taylor

Since the time of the preliminary announcement of the Atlanta meeting, which will be held 26-31 December [*Science* 121, 751 (27 May 1955)], the symposia listed therein have been implemented and augmented and the sections and participating societies, in a number of instances, have had to open additional sessions for contributed papers. From such program details as the names and addresses of authors, and from the volume of advance registrations and applications for housing accommodations, it is quite apparent that this year's 122nd AAAS meeting will enjoy an excellent attendance representing all sections of the continent and abroad.

As the list of participating societies and the outline of symposia show, virtually no principal field of science will be neglected. The special program, "The crisis in science education"—for which, unprecedentedly in recent years, all AAAS sections and most of the societies have cleared the morning of 29 December—the three sessions of the International Geophysical Year, the four-part AAAS-ORINS general symposium, "Atomic energy and agriculture," the distinguished evening addresses of James R. Killian, Jr., Warren Weaver, Robert R. Williams, and Laurence M. Gould on the four successive evenings 27-30 December, the 2-day Conference on Scientific Editorial Problems, and the special report on the Geneva International Conference on the Peaceful Uses of Atomic Energy by Clarence E. Larson and Shields Warren, with Detlev W. Bronk presiding, added to an exceptional series of symposia, all promise a particu-

larly stimulating, informative, and significant meeting.

The programs of the sessions and pertinent details on the local committees, registration, housing, and exhibitors follow.

### Contributed Papers

Sessions for contributed papers are too numerous to catalog. Of the 17 participating sections, the following nine have scheduled them: C—Chemistry, D—Astronomy, E—Geology and Geography, F—Zoological Sciences, G—Botanical Sciences, I—Psychology, L—History and Philosophy of Science, Np—Pharmacy, and Q—Education.

Participating societies with sessions for contributed papers are: American Meteorological Society, American Association of Clinical Chemists, Astronomical League, National Speleological Society, American Society of Parasitologists, Herpetologists League, Society of Systematic Zoology, Ecological Society of America, National Association of Biology Teachers, American Phytopathological Society, Society for the Advancement of General Systems Theory, National Science Teachers Association, and the American Nature Study Society.

### Special Sessions

One of the characteristic and most important features of the annual meetings of the Association is the series of outstanding general addresses by distinguished authorities that are sponsored by organizations that meet regularly with the AAAS. These special events are joint

sessions with the Association and are open to the general public of the city in which the meeting is held.

*Society of the Sigma Xi.* Tuesday, 27 Dec., 8 P.M., Dinkler Plaza Room, Hotel Dinkler Plaza. "Is there a scarcity of scientists?" by James R. Killian, Jr., president, Massachusetts Institute of Technology. Joseph W. Barker, director, Research Corporation, and president, Society of the Sigma Xi, will preside. George W. Beadle, president of the AAAS, will represent the Association.

*AAAS Presidential Address.* Wednesday, 28 Dec., 8 P.M., Sisters Chapel, Spelman College, Atlanta University. "Science and people" by Warren Weaver, vice president for natural and medical sciences, Rockefeller Foundation, and retiring president of the Association. George W. Beadle, chairman, Biology Division, California Institute of Technology, and president of the Association, will preside. Preceding the address, James V. Carmichael, president, Scripto, Inc., and general chairman of the Atlanta meeting, will speak briefly. Following the address there will be an informal AAAS Presidential Reception in the nearby gymnasium of Spelman College. All registrants and members of the local committees are cordially invited to attend. (AAAS chartered buses will carry passengers from the hotels before the address and to the hotels after the reception.)

*AAAS Special Program.* Thursday, 29 Dec., 9 A.M., Dinkler Plaza Room, Hotel Dinkler Plaza. "The crisis in science education."

*Scientific Research Society of America.* Thursday, 29 Dec., 8 P.M., Dinkler Plaza Room, Hotel Dinkler Plaza. "Chemistry as a supplement to agriculture in meeting world food problems" by Robert R. Williams, chairman, Williams-Waterman Fund for the Combat of Dietary Diseases, Research Corporation. Wallace R. Brode, associate director, National Bureau of Standards, and chairman, Scientific Research Society of America, will preside. Chauncey D. Leake, member of the AAAS board of directors, will represent the Association.

*National Geographic Society.* Thursday, 29 Dec., 8:30 P.M., Gymnasium, State College of Business Administration. "Atlantic's farthest shores" (illustrated) by Newman Bumstead, assistant chief, Cartographic Staff, National Geo-

Dr. Taylor is Associate Administrative Secretary of the AAAS, Washington, D.C.

graphic Society. Warren Weaver, retiring president of the AAAS, will preside.

*Reports on the Geneva International Conference on the Peaceful Uses of Atomic Energy.* Friday, 30 Dec., 4: 30 P.M., Committee Room 2, Municipal Auditorium. "The physical sciences" by Clarence E. Larson, vice president, National Carbon Division, Union Carbide and Carbon Corporation, Cleveland, Ohio. "Biological and medical sciences" by Shields Warren, director, Cancer Research Institute, New England Deaconess Hospital, Boston, Mass. Detlev W. Bronk, director, Rockefeller Institute for Medical Research, will preside.

*United Chapters of Phi Beta Kappa.* Friday, 30 Dec., 8 P.M., Room Dinkler B, Hotel Dinkler Plaza. "Science and the other humanities" by Laurence M. Gould, president, Carleton College. Goodrich C. White, president, Emory University, and recent president, United Chapters of Phi Beta Kappa, will preside. AAAS president-elect Paul B. Sears will represent the Association.

#### AAAS Conferences

In recent years, in addition to the Academy Conference, several other conferences have become recurrent events at AAAS meetings. Also, not infrequently, interest in special subjects may develop to the point where a special program is arranged. These conferences and special programs are open to all interested.

*Academy Conference.* Wednesday morning and afternoon, 28 Dec., Parlor F, Hotel Piedmont.

*Conference on Scientific Editorial Problems.* Wednesday and Thursday mornings and afternoons, 28-29 Dec., Library, State College of Business Administration. (See page 1069.)

*Conference on Scientific Manpower.* Cosponsorship of the AAAS Special Session, "The crisis in science education," Thursday morning, 29 Dec., Dinkler Plaza Room, Hotel Dinkler Plaza. (See page 1069.)

#### AAAS Symposia

Well-established scientists and younger specialists alike have come to anticipate the AAAS symposia that have become an increasingly important aspect of the annual meetings of the Association.

Characteristically, AAAS symposia explore relatively neglected areas of scientific inquiry or constitute up-to-date surveys of knowledge in particular fields. Such programs are significant and valuable because they focus attention on critical areas, summarize the present status of current research, and provide

positions from which to direct further research. Typically, these programs originate in the minds of the officers and committeemen of the sections of the Association and are developed by them, either personally or by others deputized as program chairmen. Often, the sectional symposia are concerned with interdisciplinary problems and are sponsored by two or more sections; participating societies also may collaborate. If the potential demand warrants it, the papers of such programs are gathered together and published by the Association as symposium volumes.

In recent years the practice has become well established of arranging, for each annual meeting, one or two programs of especially wide interest or timeliness. The responsibility for developing these sessions, sponsored by the Association as a whole, rests on the Committee on AAAS Meetings, appointed each year by the president of the Association. On occasion, a proposed sectional program may be chosen to be developed as a general symposium. More commonly, the Committee on AAAS Meetings plans and arranges these general sessions itself. The committee may invoke the aid of consultants and appoint others to implement such general programs.

At its meeting on 8 May 1955, the committee agreed that AAAS meetings should include and emphasize programs that are of importance to science as a whole. The committee decided that this Atlanta meeting should include consideration of the serious situation confronting the United States today, of too few college students electing majors and graduate work in the sciences and engineering, and the related problem of the growing shortage of qualified science teachers at both the high-school and college levels.

The problem was deemed of such general significance that a special session, on the morning of Thursday, 29 Dec., was fixed for a survey of the steps that must be taken—and the contributions that can be made—by national organizations, federal and state agencies, industry, and educational institutions. Unprecedented in recent years, no AAAS section will hold sessions on that morning, and most of the participating societies have also been able to clear this time—so that nearly all will be able to attend, together with invited delegates from AAAS affiliates and other interested agencies and institutions. The Association is indebted to all concerned for their splendid cooperation. It is anticipated that AAAS Council Meeting II, Friday morning, 30 Dec., will be largely devoted to specific steps that organized science can take to help resolve this emergency.

It was decided also that, in view of

their broad interdisciplinary scope and significance, the four-session symposium, "Atomic energy and agriculture" and the sessions of the International Geophysical Year would be cosponsored by the Association as a whole.

#### AAAS General Symposium

The AAAS and the Oak Ridge Institute of Nuclear Studies have scheduled a joint program on *Atomic Energy and Agriculture*. Parts I to IV are cosponsored by AAAS Section O—Agriculture, part I by the Ecological Society of America, parts I and II by AAAS Section G—Botanical Sciences, part II by the American Society of Plant Physiologists, Southern Section, and part III by AAAS Section F—Zoological Sciences. Arranged by a committee with C. L. Comar, Medical Division, Oak Ridge Institute of Nuclear Studies, as general chairman.

This first presentation to a large audience of the latest research and thinking on the applications of radioisotopes in the agricultural sciences anticipates—and, to a considerable extent, complements—the related and coordinated Conference on the Use of Isotopes in Agriculture that will be held 12-14 January 1956 at East Lansing, Mich., under the sponsorship of the Council of Participating Institutions of Argonne National Laboratory.

*Atomic Energy and Agriculture*, part I, "Soil-plant relations." Tuesday, 27 Dec., 2 P.M., Exhibit Hall 1, Municipal Auditorium. Arranged by Nathan S. Hall, Division of Biology and Medicine, U.S. Atomic Energy Commission, Washington, D.C. Robert F. Reitemeier, U.S. Department of Agriculture Plant Industry Station, Beltsville, Md., will preside. The program will consist of the following six parts.

1) "Uses of macronutrient isotopes in soil fertility research" by L. E. Ensinger, Department of Agronomy and Soils, and R. W. Pearson, U.S. Department of Agriculture, Alabama Polytechnic Institute.

2) "Solubility and plant utilization of micronutrients" by D. W. Thorne, Utah Agricultural Experiment Station, and H. H. Wiebe, Utah State Agricultural College.

3) "Potentialities of isotopic procedures in soil evaluation" by Maurice Fried, U.S. Department of Agriculture, Beltsville, Md.

4) "The use of radioisotopes in soil physics research" by M. D. Thorne, U.S. Department of Agriculture, Beltsville, Md., and W. A. Raney, U.S. Department of Agriculture and Mississippi State College.

5) "Role of tracers in root develop-

ment investigations" by G. W. Burton, Georgia Coastal Plain Experiment Station.

6) Presentation of John Scott award to Edgar S. McFadden, agronomist, Texas Agricultural Experiment Station by Ernest T. Trigg, City of Philadelphia Board of Directors of City Trusts, Philadelphia, Pa.

*Atomic Energy and Agriculture*, part II, "Plant metabolism and crop improvement." Wednesday, 28 Dec., 9 A.M., Exhibit Hall 1, Municipal Auditorium. Arranged by H. B. Tukey, Department of Horticulture, Michigan State University. H. B. Tukey will preside. The following six papers will be presented.

1) "Photosynthesis" by N. E. Tolbert, Oak Ridge National Laboratory.

2) "Nitrogen metabolism in plants as indicated by  $N^{15}$ " by R. M. MacVicar, Oklahoma Agricultural and Mechanical College.

3) "The translocation of organic nutrient in plants" by C. A. Swanson, Ohio State University.

4) "Nutrient uptake, with special reference to foliar absorption" by S. H. Wittwer, Michigan State University.

5) "Uptake and movement of plant regulators" by J. W. Mitchell, U.S. Department of Agriculture Plant Industry Station, Beltsville, Md.

6) "Use of radiation in plant breeding" by W. Ralph Singleton, University of Virginia.

*Atomic Energy and Agriculture*, part III, "Animal metabolism." Wednesday, 28 Dec., 2 P.M., Exhibit Hall 1, Municipal Auditorium. Arranged by Homer Patrick, program director, University of Tennessee-Atomic Energy Commission Agricultural Research Program. Homer Patrick will preside. The following four papers will be presented.

1) "Micronutrient metabolism" by G. K. Davis, University of Florida.

2) "Macronutrient metabolism" by C. L. Comar, Oak Ridge Institute of Nuclear Studies.

3) "Lactation and hormones" by J. C. Shaw, University of Maryland.

4) "Use of isotopes in studies of amino acid synthesis in animals" by J. E. Stekol, Institute for Cancer Research, Philadelphia, Pa.

*Atomic Energy and Agriculture*, part IV, "Food sterilization." Thursday, 29 Dec., 2 P.M., Exhibit Hall 1, Municipal Auditorium. Arranged by B. F. Trum, Veterinary Corps, United States Army. H. R. Kraybill, American Meat Institute Foundation, Chicago, Ill., and B. F. Trum will preside. The following seven papers will be presented.

1) "Introduction" by H. R. Kraybill.

2) "Radiation facilities designed to process commercial quantities of food products" by L. E. Brownell and J. U. Nehemias, Engineering Research Insti-

tute, University of Michigan, and J. J. Bulmer, University of Michigan.

3) "The design of a megacurie radiation source" by Bernard Manowitz and D. J. Metz, Brookhaven National Laboratory, and R. H. Bretton, Yale University.

4) "The effect of irradiation sterilization on protein, carbohydrate, and fat with particular reference to their nutritive value" by B. C. Johnson, University of Illinois.

5) "Toxicological studies on food sterilized by ionizing radiations" by M. S. Read and H. F. Kraybill, Army Medical Nutrition Laboratory, Denver, Colo.

6) "Present-day status of radiation sterilization" by B. E. Proctor and S. A. Goldblith, Massachusetts Institute of Technology.

7) "Feasibility of food irradiation" by R. G. H. Siu, Office of the Quartermaster General, U.S. Army, Washington, D.C.

#### International Geophysical Year

The United States National Committee for the International Geophysical Year, established by the National Academy of Sciences, is in charge of planning, executing, and directing the U.S. program with the aid of technical panels and committees composed of many of the nation's leading geophysicists. Federal support for the program has been obtained by the USNC-IGY through the National Science Foundation.

The nations participating in the IGY include: Argentina, Australia, Austria, Belgium, Brazil, Burma, Canada, Chile, Czechoslovakia, Denmark, Finland, France, East Germany, West Germany, Great Britain, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Mexico, Morocco, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Spain, Sweden, Switzerland, Thailand, Tunisia, Union of South Africa, U.S.S.R., United States, and Yugoslavia. Each country has responsibility for planning and executing its own program under a general plan developed by the Comité Spécial de l'Année Géophysique Internationale, appointed by the International Council of Scientific Unions.

Simultaneous synoptic investigations throughout the world will be carried out in meteorology, latitude and longitude determinations, geomagnetism, gravity measurements, ionospheric physics, aurora and airglow, solar activity, cosmic rays, glaciology, oceanography, seismology, and rocket exploration of the upper atmosphere. In addition, the U.S. effort includes upper atmosphere research using satellite vehicles.

The program committee is composed

of Joseph Kaplan, University of California, Los Angeles, and Hugh Odishaw, National Academy of Sciences, cochairmen; Wallace W. Atwood, Jr., National Academy of Sciences; Werner A. Baum, Florida State University; J. Wallace Joyce, National Science Foundation; G. F. Schilling, National Academy of Sciences; Alan H. Shapley, National Bureau of Standards, Boulder, Colo.; Waldo E. Smith, American Geophysical Union; and Raymond L. Taylor, AAAS.

The following three programs are joint programs of the AAAS, the U.S. National Committee for the IGY of the National Academy of Sciences-National Research Council, the American Geophysical Union, and the National Science Foundation.

*International Geophysical Year*, part I, "The earth." Tuesday, 27 Dec., 9 A.M., Committee Room 1, Municipal Auditorium. Joseph Kaplan, University of California, Los Angeles, will preside. The following six papers will be presented.

1) "Earth, sun, and interplanetary medium" by Fred L. Whipple, Harvard University.

2) "The oceans and the earth" by Roger R. Revelle, Scripps Institution of Oceanography.

3) "Glaciers and ice fields" by William B. O. Field, American Geographical Society, New York.

4) "Seismology and the earth's structure" by James B. Macelwane, St. Louis University.

5) "The earth's gravity" by George P. Woollard, University of Wisconsin.

6) "International aspects of the IGY program" by Lloyd V. Berkner, Associated Universities, Inc., New York.

*International Geophysical Year*, part II, "The atmosphere." Wednesday, 28 Dec., 9 A.M., Committee Room 1, Municipal Auditorium. Lloyd V. Berkner, Associated Universities, Inc., will preside. The following six papers will be presented.

1) "The earth's magnetic field" by E. O. Hulburt, Naval Research Laboratory.

2) "The ionosphere" by M. G. Morgan, Dartmouth College.

3) "The aurora" by C. T. Elvey, University of Alaska.

4) "The airglow" by E. R. Manring, Air Force Cambridge Research Center, Sacramento Peak, Sunspot, N.M.

5) "Geophysical aspects of cosmic rays" by S. E. Forbush, Carnegie Institution of Washington.

6) "The IGY program of the United States" by Joseph Kaplan, University of California, Los Angeles.

*International Geophysical Year*, part III, "The atmosphere," continued. Thursday, 29 Dec., 9 A.M., Committee Room 1, Municipal Auditorium. Alan H. Shapley, Central Radio Propagation



Laboratory, Boulder, Colo., will preside. The following six papers will be presented.

1) "Weather and atmosphere" by Harry Wexler, U.S. Weather Bureau.

2) "Rocket exploration of the upper atmosphere" by James Alfred Van Allen, State University of Iowa.

3) "The IGY earth satellite program" by Homer E. Newell, Jr., Naval Research Laboratory.

4) "The antarctic IGY program" by Laurence M. Gould, Carleton College.

5) "The equatorial IGY program" by R. C. Peavey, National Academy of Sciences.

6) "The northern latitudes IGY program" by Nathaniel C. Gerson, Air Force Cambridge Research Center, Cambridge, Mass.

## Sectional and Societal Symposia

### Physics

*Radiation Measurements.* Tuesday, 27 Dec., 2 P.M. Arranged by J. H. Howey and J. H. Tolan, Georgia Institute of Technology. Fred L. Mohler, National Bureau of Standards, will preside. Speakers: Marshall Brucer, Oak Ridge Institute of Nuclear Studies; Jack Francis, Oak Ridge National Laboratory; J. H. Tolan, Georgia Institute of Technology and Emory University.

*The Role of Physics in Premedical Education.* Wednesday, 28 Dec., 9:30 A.M. Program of Sigma Pi Sigma, cosponsored by AAAS Section B-Physics and Alpha Epsilon Delta. Arranged by Daniel R. McMillan, head, Physics Department, Emory University. Daniel R. McMillan will preside. Speakers: R. T. Lagemann, Vanderbilt University; Peter A. Stewart, Emory University Medical School; H. Davis Bruner, Emory University Medical School.

*Research Progress in Physics.* Wednesday, 28 Dec., 2 P.M. Arranged by J. H. Howey, Georgia Institute of Technology. Clifford K. Beck, North Carolina State College, will preside. Speakers: G. L. Pearson, Bell Telephone Laboratories; Clyde L. Cowan, Jr., Los Alamos Scientific Laboratory; Arthur E. Ruark, University of Alabama; Charles E. Falk, Brookhaven National Laboratory.

*Training for Careers in Physics.* Thursday, 29 Dec., 2 P.M. Arranged by J. H. Howey, Georgia Institute of Technology. Alan T. Waterman, National Science Foundation, will preside. Speakers: Gerald A. Rosselot, Bendix Aviation Corporation; Clifford K. Beck, North Carolina State College; Josiah Crudup, Brenau College.

### Chemistry

*Recent Concepts in Clinical Chemistry.* Monday, 26 Dec., 2 P.M. Program of

the American Association of Clinical Chemists. Arranged by Albert E. Sobel, Jewish Hospital of Brooklyn, Brooklyn, N.Y. Albert E. Sobel will preside. Speakers: Albert E. Sobel; Joseph H. Gast, College of Medicine, Baylor University; Samuel Natelson, Rockford Memorial Hospital, Rockford, Ill.; D. B. Zilver-smit, University of Tennessee, Memphis; Henry G. Kunkel, Rockefeller Institute for Medical Research.

*Patterns of Biochemical and Histological Responses to Chemical Agents,* part I. Wednesday, 28 Dec., 9 A.M. Program of AAAS Section C-Chemistry, cosponsored by AAAS Section N-Medical Sciences and the American Chemical Society, Georgia Section. Arranged by Jules Cass, University of Cincinnati. Jules Cass will preside. Speakers: Jules Cass; Jack Schubert, Argonne National Laboratory; Parkhurst Shore and Bernard B. Brodie, National Heart Institute, Bethesda, Md.; David A. Karnofsky, Cornell University Medical College.

*Patterns of Biochemical and Histological Responses to Chemical Agents,* part II. Wednesday, 28 Dec., 2 P.M. Program of AAAS Section C-Chemistry, cosponsored by AAAS Section N-Medical Sciences and the American Chemical Society, Georgia Section. Arranged by Jules Cass, University of Cincinnati. Jules Cass will preside. Speakers: J. R. M. Innes, Chemical Corps Medical Laboratories; James Fouts and Bernard B. Brodie, National Heart Institute, Bethesda, Md.

*The Sedimentary Kaolins Along the Southeastern Fall Line.* Thursday, 29 Dec., 2 P.M. Joint Program of AAAS Section C-Chemistry and the American Chemical Society, Georgia Section, cosponsored by AAAS Section E-Geology and Geography. Arranged by LeRoy A. Woodward, Scripto, Inc., Atlanta Ga. LeRoy A. Woodward will preside. Speakers: Thomas L. Kessler, Foote Mineral Co., Kings Mountain, N.C.; C. G. Albert, Minerals and Chemicals Corporation of America, McIntyre, Ga.; G. W. Brindley, Pennsylvania State University; L. A. Woodward; Ivan L. Lester, Georgia Kaolin Company, Dry Branch, Ga.; Lane Mitchell, Georgia Institute of Technology.

*Radiation Chemistry and Related Fields,* part I. Friday, 30 Dec., 9 A.M. Program of AAAS Section C-Chemistry, cosponsored by AAAS Section B-Physics and the American Chemical Society, Georgia Section. Arranged by Ellison H. Taylor, Oak Ridge National Laboratory. Ellison H. Taylor will preside. Speakers: S. C. Lind, Oak Ridge National Laboratory; William H. Hamill, University of Notre Dame; A. O. Allen, Brookhaven National Laboratory.

*Radiation Chemistry and Related Fields,* part II. Friday, 30 Dec., 2 P.M.

Program of AAAS Section C-Chemistry, cosponsored by the AAAS Section B-Physics and the American Chemical Society, Georgia Section. Arranged by Ellison H. Taylor, Oak Ridge National Laboratory. Ellison H. Taylor will preside. Speakers: Ralph Livingston, Oak Ridge National Laboratory; J. H. Crawford, Jr., Oak Ridge National Laboratory; Harvey M. Patt, Argonne National Laboratory.

### Geology and Geography

*Military Geology,* part I. Wednesday, 28 Dec., 9 A.M. Joint session of AAAS Section E-Geology and Geography, the Association of American Geographers, Southeastern Division, and the Geological Society of America. Arranged by Frank C. Whitmore, Jr., U.S. Geological Survey, Washington, D.C. Frank C. Whitmore, Jr., will preside. Speakers: Lawrence D. Bonham, U.S. Geological Survey, Washington, D.C.; Arnold C. Orvedal and Howard M. Smith, Soil Conservation Service, U.S. Department of Agriculture; Dwight W. Swanson and Franklin Newhall, Soil Conservation Service, U.S. Department of Agriculture; Lloyd Spetzman, U.S. Geological Survey, Washington, D.C.; Louis C. Peltier, U.S. Geological Survey, Washington, D.C.; William Craig, Corps of Engineers, U.S. Army.

*Military Geology,* part II. Wednesday, 28 Dec., 1:30 P.M. Joint session of AAAS Section E-Geology and Geography, the Association of American Geographers, Southeastern Division, and the Geological Society of America. Arranged by Frank C. Whitmore, Jr., U.S. Geological Survey, Washington, D.C. Frank C. Whitmore, Jr., will preside. Speakers: W. C. Iseminger, Corps of Engineers, U.S. Army; Charles C. Bates, Hydrographic Office, Navy Department; Maurice J. Terman, U.S. Geological Survey, Washington, D.C.; Arnold C. Orvedal and Anton J. Vessel, Soil Conservation Service, U.S. Department of Agriculture; Nicholas Shreders, U.S. Geological Survey, Washington, D.C.; Edward C. T. Chao, U.S. Geological Survey, Washington, D.C.

### Zoological Sciences

*Formation and Early Development of the Embryo,* part I. Tuesday, 27 Dec., 9 A.M. Program of AAAS Section F-Zoological Sciences, cosponsored by the American Society of Zoologists and the Association of Southeastern Biologists. Arranged by R. C. von Borstel, Oak Ridge National Laboratory, C. B. Metz, Florida State University, and Albert Tyler, California Institute of Technology. Albert Tyler will preside. Speakers: W. S. Vincent, College of Medicine, State University of New York, Syracuse; A. L. Colwin, Queens College; C. B.



Metz; M. C. Chang, Worcester Foundation for Experimental Biology.

*Formation and Early Development of the Embryo*, part II. Tuesday, 27 Dec., 2 P.M. Program of AAAS Section F-Zoological Sciences, cosponsored by the American Society of Zoologists and the Association of Southeastern Biologists. Arranged by R. C. von Borstel, C. B. Metz, and Albert Tyler. Albert Tyler will preside. Speakers: Hans Borei, University of Pennsylvania; J. R. Gregg, Columbia University; R. C. von Borstel; Albert Tyler.

*Distribution and Speciation of Cave Vertebrates*. Tuesday, 27 Dec., 2:00 P.M. Joint session of the National Speleological Society and the Herpetologists League. Arranged by G. Nicholas, LaSalle High School, Cumberland, Md., and James A. Fowler, Academy of Natural Sciences of Philadelphia. James A. Fowler will preside. Speakers: Kenneth Dearolf, Reading Public Museum, Reading, Pa.; Thomas C. Barr, Vanderbilt University; Charles E. Mohr, Audubon Nature Center, Greenwich, Conn.; Robert Inger and Loren Woods, Chicago Natural History Museum; Victor H. Hutchison, Duke University; Edward McCrady, University of the South.

*The Systematic Content of General Biology Courses*. Friday, 30 Dec., 9 A.M. Arranged by Ross H. Arnett, St. John Fisher College, Rochester, N.Y. Ross H. Arnett will preside. Speakers: William C. Beaver, Wittenberg College; Charles Heimsch, University of Texas; Andrew Stauffer, Ohio Northern University; A. M. Winchester, John B. Stetson University.

#### Biological Sciences

*Applications of Serology in Biological Research*. Wednesday, 28 Dec., 9 A.M. Program of the Society of General Physiologists, cosponsored by AAAS Sections F-Zoological Sciences and G-Botanical Sciences and the Association of Southeastern Biologists. Arranged by Norman G. Anderson, Oak Ridge National Laboratory. H. R. Wolfe, University of Wisconsin, will preside. Speakers: H. R. Wolfe; T. Makinodan, Oak Ridge National Laboratory; Ray D. Owen, California Institute of Technology; Wiktor W. Nowinski, University of Texas Medical Branch; Norman G. Anderson.

*The Species Problem*, part I. Wednesday, 28 Dec., 2 P.M. Program of the Association of Southeastern Biologists, cosponsored by AAAS Sections F-Zoological Sciences and G-Botanical Sciences, American Society of Naturalists, American Society of Parasitologists, Genetics Society of America, and the Society of Systematic Zoology. Arranged by Ernst Mayr, Museum of Comparative Zoology, Harvard University. Ernst Mayr will preside. Speakers: Ernst Mayr; Hampton L. Carson, Washington University;

Verne E. Grant, Rancho Santa Ana Botanic Garden, Claremont, Calif.; John L. Brooks, Yale University; John Imbrie, Columbia University.

*The Species Problem*, part II. Thursday, 29 Dec., 2 P.M. Program of the Association of Southeastern Biologists, cosponsored by AAAS Sections F-Zoological Sciences and G-Botanical Sciences, American Society of Naturalists, American Society of Parasitologists, Genetics Society of America, and the Society of Systematic Zoology. Arranged by Ernst Mayr. Ernst Mayr will preside. Speakers: T. M. Sonneborn, Indiana University; John A. Moore, Columbia University; C. Ladd Prosser, University of Illinois; Ernst Mayr.

#### Botanical Sciences

*The Tobacco Plant*. Tuesday, 27 Dec., 9 A.M. Program of AAAS Section G-Botanical Sciences, cosponsored by the American Phytopathological Society and the American Society of Plant Physiologists, Southern Section. Arranged by Barry Commoner, Washington University. Barry Commoner will preside. Speakers: W. G. Frankenburg, General Cigar Company, Lancaster, Pa.; M. L. Zucker, Connecticut Agricultural Experiment Station; H. H. Smith, Cornell University; E. E. Clayton, American Sumatra Corporation, New York.

*The Cotton Plant*. Tuesday, 27 Dec., 2 P.M. Program of AAAS Section G-Botanical Sciences, cosponsored by the American Phytopathological Society and the American Society of Plant Physiologists, Southern Section. Arranged by Barry Commoner. James H. M. Henderson, Tuskegee Institute, will preside. Speakers: Wayne C. Hall, Texas Agricultural Experiment Station, College Station; Wanda K. Farr, Saint Clairsville, Ohio; S. G. Stephens, North Carolina State College; J. T. Presley, U.S. Department of Agriculture, Agricultural Research Service, Beltsville, Md.

*Plant Pathologists Can Use TV*. Wednesday, 28 Dec., 8 P.M. Program of the American Phytopathological Society. Actual TV programs will be presented over a closed circuit TV system and kinescopes of plant pathology programs previously presented by institutions will be shown. Appreciation is expressed for TV facilities provided by Haskell Boyter, director of radio and television education, Atlanta Public Schools. W. H. Bragonier, Iowa State College, will preside. Participants: A. F. Sherf, Cornell University; M. C. Shurtleff, Iowa State College; H. R. Garriss, North Carolina State College.

*Implications of Current Physiological and Biochemical Research on Marine Algae*. Friday, 30 Dec., 9 A.M. Program of the American Society of Plant Physiologists, Southern Section, cosponsored

by AAAS Section G-Botanical Sciences and the Botanical Society of America, Southeastern Section. Arranged by Aubrey W. Naylor, Duke University. Lawrence R. Blinks, Hopkins Marine Station, will preside. Speakers: Luigi Provasoli, Haskins Laboratories, New York; William B. Wilson, U.S. Fish and Wildlife Service, Galveston, Tex.; J. H. Ryther, Woods Hole Oceanographic Institution; Theodore R. Rice, U.S. Fish and Wildlife Service, Beaufort, N.C.

#### Psychology

*Status of Military Psychology*. Tuesday, 27 Dec., 9 A.M. Program of AAAS Section I-Psychology, cosponsored by the Southern Society for Philosophy and Psychology. Arranged by Wilse B. Webb, U.S. Naval School of Aviation Medicine. Wilse B. Webb will preside. Speakers: Wilse B. Webb; Lloyd G. Humphreys, Air Force Personnel and Training Command; Denzel D. Smith, Office of Naval Research; Walter F. Grether, Aero Medical Laboratory, Wright-Patterson Air Force Base; Robert L. Egbert, Human Resources Research Office, Continental Training Command.

*Maternal Deprivation*. Tuesday, 27 Dec., 9 A.M. Program of the Society for Research in Child Development. Arranged by William C. Rhodes, Division of Mental Hygiene, Georgia Department of Public Health, Atlanta. William C. Rhodes will preside. Speakers: Marie Skodak, Consulting Psychologist, Flint, Mich.; Phyllis Matthews, Psychologist, Cobb County, Ga.; Florence Beasley, Georgia Department of Public Health.

*Learning*. Tuesday, 27 Dec., 2 P.M. Program of AAAS Section I-Psychology, cosponsored by the Southern Society for Philosophy and Psychology. Arranged by Stanford C. Erickson, Vanderbilt University. Stanford C. Erickson will preside. Speakers: Clyde E. Noble, Louisiana State University; Robert E. Morin and Daniel B. Cruse, University of Texas; Henry Wunderlich, University of Florida; Gilbert W. Meier, Vanderbilt University.

*Role Learning in Children*. Tuesday, 27 Dec., 2 P.M. Program of the Society for Research in Child Development. Arranged by William C. Rhodes, Division of Mental Hygiene, Georgia Department of Public Health, Atlanta. Walter D. Smith, Florida State University, will preside. Speakers: J. W. Wiggins, Emory University; R. L. Witherspoon, Ruth Connor, and Earl Koos, Florida State University.

*Sensory Processes*. Wednesday, 28 Dec., 9 A.M. Program of AAAS Section I-Psychology, cosponsored by the Southern Society for Philosophy and Psychology and the American Physiological Society. Arranged by John F. Hahn, University of Virginia. John F. Hahn will preside.

Speakers: Lloyd M. Beidler, Florida State University; Frank A. Geldard, University of Virginia; Merle Lawrence, University of Michigan; Cecil W. Mann, Tulane University; Lorrin A. Riggs, Brown University. Discussants: T. G. Andrews, University of Maryland; J. W. Gebhard, Johns Hopkins University.

**Brain Function.** Wednesday, 28 Dec., 2 P.M. Program of AAAS Section I—Psychology, cosponsored by the Southern Society for Philosophy and Psychology and the American Physiological Society. Arranged by Harlow W. Ades, Southwestern Medical School, University of Texas, Austin. Harlow W. Ades will preside. Speakers: John P. Nafe and D. R. Kenshalo, Florida State University; Irving T. Diamond, Jay Goldberg, and William D. Neff, University of Chicago; Arthur J. Riopelle, Emory University, and Harlow W. Ades; Walter A. Mickle, Tulane University.

**Primate Behavior.** Thursday, 29 Dec., 2 P.M. Program of AAAS Section I—Psychology, cosponsored by the Southern Society for Philosophy and Psychology. Arranged by Arthur J. Riopelle, Emory University. Arthur J. Riopelle will preside. Speakers: J. M. Warren, University of Oregon; Roger T. Davis, University of Texas; Henry W. Nissen and Catherine Nissen, Yerkes Laboratories of Primate Biology; Harry F. Harlow, University of Wisconsin; Austin H. Riesen, University of Chicago; Neil C. Tappan, Emory University.

#### Social and Economic Sciences

**Contemporary Patterns in Southern Population, Migration, and Urbanization.** Wednesday, 28 Dec., 2 P.M. Program of AAAS Section K—Social and Economic Sciences. Arranged by Donald P. Ray, George Washington University. Barnett O. Williams, University of Georgia, will preside. Speakers: Homer L. Hitt, Louisiana State University; Harlan W. Gilmore, Tulane University, and Nicholas J. Demerath, University of North Carolina.

**Political Trends in the South.** Thursday, 29 Dec., 2 P.M. Joint session of AAAS Section K—Social and Economic Sciences and the Southern Political Science Association. Arranged by Donald P. Ray, George Washington University. Lynwood M. Holland, Emory University, will preside. Speakers: Lee S. Greene, University of Tennessee; Jasper B. Shannon, University of Kentucky.

**Some Peaceful Uses of Atomic Energy.** Thursday, 29 Dec., 8 P.M. Program of the National Academy of Economics and Political Science, with the collaboration of the National Social Science Honor Society, Pi Gamma Mu; cosponsored by AAAS Section K—Social and Economic Sciences and the Oak Ridge Institute of Nuclear Studies. Arranged by Donald

Armstrong, U.S. Army (ret.), Washington, D.C. Marshall Brucer, Oak Ridge Institute of Nuclear Studies, will preside. Speakers: W. Kenneth Davis, U.S. Atomic Energy Commission, Washington, D.C.; Shields Warren, Cancer Research Institute, New England Deaconess Hospital, Boston, Mass.; Walker L. Cislner, Detroit Edison Company.

#### History and Philosophy of Science

**Entropy.** Tuesday, 27 Dec., 2 P.M. Program of the Society for the Advancement of General Systems Theory. Arranged by Ludwig von Bertalanffy, Mount Sinai Hospital, Los Angeles, Calif. W. Ross Ashby, Center for Advanced Study in the Behavioral Sciences, Stanford, Calif., will preside. Speakers: Ludwig von Bertalanffy; Anatol Rapoport, University of Michigan. Discussant: Walter Rosenblith, Massachusetts Institute of Technology.

**Sociology of Science.** Wednesday, 28 Dec., 2 P.M. Program of AAAS Section L—History and Philosophy of Science, cosponsored by the History of Science Society and the Philosophy of Science Association. Arranged by Jane M. Oppenheimer, Bryn Mawr College. Chauncey D. Leake, Ohio State University College of Medicine, will preside. Speakers: Philipp Frank, Institute for the Unity of Science, Cambridge, Mass.; Harold K. Schilling, Pennsylvania State University; Paul B. Sears, Yale University; Philip Rieff, Brandeis University.

**Science and Humanities.** Thursday, 29 Dec., 2 P.M. Program of AAAS Section L—History and Philosophy of Science, cosponsored by AAAS Section Q—Education, the History of Science Society, and the Philosophy of Science Association. Arranged by Raymond J. Seeger, National Science Foundation. Raymond J. Seeger will preside. Speakers: Harcourt Brown, Brown University; William D. Stahlman, Massachusetts Institute of Technology; Raymond S. Stites, National Gallery of Art; Richard Courant, New York University.

**Creativity in Science.** Thursday, 29 Dec., 8 P.M. Program of AAAS Section L—History and Philosophy of Science, cosponsored by AAAS Section I—Psychology, the History of Science Society, and the Southern Society for Philosophy and Psychology. Arranged by Raymond J. Seeger, National Science Foundation. Raymond J. Seeger will preside. Speakers: Samuel Eilenberg, Columbia University; Howard Hanson, University of Rochester; W. F. G. Swann, Bartol Research Foundation; Lamar Dodd, University of Georgia.

#### Engineering

**Automation, part I.** Tuesday, 27 Dec., 9 A.M. Program of AAAS Section M—Engineering, cosponsored by AAAS Sec-

tion P—Industrial Science. Arranged by Mario J. Goglia, Georgia Institute of Technology. W. S. Buckingham, Georgia Institute of Technology, will preside. Panelists: Frank F. Groseclose, Georgia Institute of Technology; Lillian M. Gilbreth, Montclair, N.J.; James Stern, UAW—CIO Automation Committee, Detroit, Mich.; Adam Abruzzi, Stevens Institute of Technology.

**Automation, part II.** Tuesday, 27 Dec., 2:30 P.M. Program of AAAS Section M—Engineering, cosponsored by AAAS Section P—Industrial Science. Arranged by Mario J. Goglia, Georgia Institute of Technology. E. K. Ritter, Georgia Institute of Technology, will preside. A tour of the Rich Computer Center at Georgia Institute of Technology will be followed by a discussion of computers presented by the staff of the Rich Computer Center.

**Socio-economic Aspects of Orthopedic Engineering, part I.** Friday, 30 Dec., 9:30 A.M. Program of AAAS Section M—Engineering, cosponsored by AAAS Sections K—Social and Economic Sciences and N—Medical Sciences. Arranged by Eugene F. Murphy, Prosthetic and Sensory Aids Service, Veterans Administration, New York. Thomas P. Goodwyn, State Division of Vocational Rehabilitation, Atlanta, Ga., will preside. Speakers: Robert L. Bennett, Warm Springs Foundation, Warm Springs, Ga.; Grace Marie Freymann, Warm Springs Foundation; Donald Dabelstein, Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, Washington, D.C.

**Socio-economic Aspects of Orthopedic Engineering, part II.** Friday, 30 Dec., 1:30 P.M. Program of AAAS Section M—Engineering, cosponsored by AAAS Sections K—Social and Economic Sciences and N—Medical Sciences. Arranged by Eugene F. Murphy, Prosthetic and Sensory Aids Service, Veterans Administration, New York. E. B. Whitten, National Rehabilitation Association, Washington, D.C., will preside. Speakers: McCarthy Hanger, Jr., J. E. Hanger, Inc., St. Louis, Mo., and Orthopedic Appliance and Limb Manufacturers Association; W. Frank Harmon, Atlanta Brace Shop, Atlanta, Ga., and Orthopedic Appliance and Limb Manufacturers Association; Augustus Thorndike, Chestnut Hill, Mass., and Eugene F. Murphy and Anthony Staros, Prosthetic and Sensory Aids Service, Veterans Administration, New York.

#### Medical Sciences

**Microbiology and Medical Research, part I, "Nutrition."** Tuesday, 27 Dec., 9 A.M. Program of AAAS Section N—Medical Sciences, cosponsored by AAAS Section F—Zoological Sciences. Arranged by S. E. Luria, University of Illinois. Har-

old D. West, Meharry Medical College, will preside. Speakers: B. D. Davis, New York University College of Medicine; J. W. Moulder, University of Chicago; G. W. Kidder, Amherst College; Harry Eagle, National Microbiological Institute, National Institutes of Health.

*Physiological Bases in Psychiatry*, part I, "Comparative therapeutic values of new agents in various behavioral disturbances." Tuesday 27 Dec., 9 A.M. Program of the American Psychiatric Association, cosponsored by the American Physiological Society. Harold E. Himwich, Galesburg State Research Hospital, Galesburg, Ill., is program chairman. Speakers: Herman Denber and Etta G. Bird, Manhattan State Hospital, New York; Werner Tuteuf, Elgin State Hospital, Elgin, Ill.; Frank J. Ayd, Jr., Baltimore, Md.; Veronica M. Pennington, Mississippi State Hospital, Whitfield; Carl C. Pfeiffer, N. S. Apter, and M. R. Berry, Emory University School of Medicine; Nina Toll, Middletown, Conn.; Harold E. Himwich; William Gallagher, Manteno State Hospital, Manteno, Ill.; Nathan S. Kline, Rockland State Hospital, Orangeburg, N.Y.

*Microbiology and Medical Research*, part II, "Metabolism." Tuesday, 27 Dec., 2 P.M. Program of AAAS Section N—Medical Sciences, cosponsored by AAAS Section F—Zoological Sciences. Arranged by S. E. Luria. Ernest Bueding, School of Medicine, Louisiana State University, New Orleans, will preside. Speakers: V. A. Najjar, Johns Hopkins University; S. S. Cohen, University of Pennsylvania; W. E. Knox, Harvard Medical School; J. G. Hirsch, Rockefeller Institute for Medical Research.

*Physiological Bases in Psychiatry*, part II: "Basic studies of new psychopharmacological agents." Tuesday, 27 Dec., 2 P.M. Program of the American Psychiatric Association, cosponsored by the American Physiological Society. Arranged by Harold E. Himwich. Speakers: Richard Smith and Arthur Riopelle, Emory University; Amedeo S. Marrazzi and E. Ross Hart, Army Chemical Center, Md.; James E. P. Toman, Michael Reese Hospital, Chicago, Ill., and Guy M. Everett, Abbott Laboratories, North Chicago, Ill.; C. D. Hendley, T. E. Lynes, and F. M. Berger, Wallace Laboratories, New Brunswick, N.J.; Harold E. Himwich; Robert G. Grenell, University of Maryland School of Medicine; Abram Hoffer, University Hospital, Saskatoon, Canada; Bernard B. Brodie, National Institutes of Health, Bethesda, Md.

*Microbiology and Medical Research*, part III, "Radiation effects." Wednesday, 28 Dec., 9 A.M. Program of AAAS Section N—Medical Sciences, cosponsored by AAAS Section F—Zoological Sciences. Arranged by S. E. Luria. C. P. Miller, University of Chicago, will preside.

Speakers: Kimball C. Atwood, Oak Ridge National Laboratory; G. E. Stapleton, Oak Ridge National Laboratory; B. N. Jaroslow, Argonne National Laboratory; C. P. Miller, University of Chicago.

*Physiological Bases in Psychiatry*, part III, "Basic studies of alcohol." Wednesday, 28 Dec., 9 A.M. Program of the American Psychiatric Association, cosponsored by the American Physiological Society. Arranged by Harold E. Himwich. Speakers: Robert G. Grenell, University of Maryland School of Medicine; Ernst Fischer, Medical College of Virginia; W. W. Westerfield, State University of New York Medical Center, Syracuse; J. C. Forbes and G. M. Duncan, Medical College of Virginia; Mark D. Altschule, McLean Hospital, Waverley, Mass.; Curt P. Richter, Johns Hopkins Hospital, Baltimore, Md.; Harvey B. Haag, Gerda I. Klingman, and Ruby Bane, Medical College of Virginia; W. Horsley Gantt, Johns Hopkins University School of Medicine; Theodore Koppanyi, Georgetown University School of Medicine.

*Microbiology and Medical Research*, part IV, "Infection and chemotherapy." Wednesday, 28 Dec., 2 P.M. Program of AAAS Section N—Medical Sciences, cosponsored by AAAS Section F—Zoological Sciences. Arranged by S. E. Luria. C. C. Randall, Vanderbilt University, will preside. Speakers: S. E. Luria; D. R. Ginder, Emory University; G. H. Hitchings, Burroughs Wellcome and Company Research Laboratories, Tuckahoe, N.Y.; Igor Tamm, Rockefeller Institute for Medical Research. Presentation of the Theobald Smith award. Presentation of the Anne Frankel Rosenthal Memorial award for Cancer Research.

*Physiological Bases in Psychiatry*, part IV, "Alcohol addiction: etiology and treatment." Wednesday, 28 Dec., 2 P.M. Program of the American Psychiatric Association, cosponsored by the American Physiological Society. Arranged by Harold E. Himwich. Speakers: Ruth Fox, Alcoholics Treatment Center, New York; Milton Avol, Van Nuys, Calif.; Joseph F. Fazekas, District of Columbia General Hospital, Washington; Richard C. Proctor, Bowman Gray School of Medicine, Winston-Salem, N.C.; Joseph Thimann, Washingtonian Hospital, Boston, Mass.; David J. Myerson, Long Island Hospital, Boston, Mass.; Jackson A. Smith, Nebraska Psychiatric Institute, Omaha; Ebbe Curtis Hoff, Division of Alcohol Studies and Rehabilitation, Richmond, Va.; Oskar Diethelm, New York Hospital, New York.

*Place of Experimentation in Hospital Administration*. Thursday, 29 Dec., 2 P.M. Program of the American Association of Hospital Consultants. Arranged by Jack Masur, Bureau of Medical Services, U.S. Public Health Serv-

ice, Washington, D.C. Jacques B. Norman, Greenville, S.C., will preside. Speakers: E. M. Bluestone, Montefiore Hospital, New York; E. Dwight Barnett, School of Public Health, Columbia University. Discussants: John E. Gorrell, National Foundation for Infantile Paralysis, New York; Anthony J. J. Rourke, New Rochelle, N.Y.

## Dentistry

*Newer Knowledge of the Physiology of Saliva*, part I. Wednesday, 28 Dec., 10 A.M. Program of AAAS Section N—Dentistry, cosponsored by the American College of Dentists, American Dental Association, and the International Association for Dental Research, North American Division. Arranged by J. F. Volker, School of Dentistry, University of Alabama. J. F. Volker will preside. Speakers: C. E. Klapper, University of Alabama Medical Center, Birmingham; H. H. Chauncey, P. A. Weiss, and V. F. Lisanti, Tufts College School of Dental Medicine, Boston, Mass.; Leon Schneyer, University of Alabama Medical Center, Birmingham; John Haldi and Winfrey Wynn, Emory University School of Dentistry; Donald B. Giddon and V. F. Lisanti, Tufts College School of Dental Medicine, Boston, Mass.

*Newer Knowledge of the Physiology of Saliva*, part II. Wednesday, 28 Dec., 2 P.M. Arranged by J. F. Volker, School of Dentistry, University of Alabama. John Haldi, Emory University School of Dentistry, will preside. Speakers: Ward Pigman, Jane Reid, and William Hawkins, University of Alabama Medical Center, Birmingham; Jane Reid and Ward Pigman; W. G. Shafer and Joseph Muhler, Indiana University School of Dentistry, Indianapolis; S. B. Barker, H. S. Schwartz, and W. J. Lewis, University of Alabama Medical Center, Birmingham; Winfrey Wynn and John Haldi, Emory University School of Dentistry, Atlanta, Ga.; Richard S. Manly, Tufts College School of Dental Medicine, Boston, Mass.

## Pharmacy

*Applications of Nucleonics to the Health Professions*. Tuesday, 27 Dec., 8 P.M. Program of AAAS Section N—Pharmacy, cosponsored by the American Pharmaceutical Association, Scientific Section; the American Association of Colleges of Pharmacy; the American Society of Hospital Pharmacists; and the American College of Apothecaries. Arranged by John E. Christian, Purdue University. John E. Christian will preside. Speakers: Marshall Brucer, Oak Ridge Institute of Nuclear Studies; Henry A. Blair, School of Medicine and Dentistry, University of Rochester; Howard E. Skipper, Southern Research Institute; L. E. Brownell, University of



Michigan; George E. Burch, School of Medicine, Tulane University.

*Hazardous Household Chemicals and Agricultural Poisons.* Thursday, 29 Dec., 8 P.M. Program of AAAS Section N-Pharmacy, cosponsored by the Committee on Toxicology and the Committee on Pesticides, American Medical Association; the American Pharmaceutical Association, Scientific Section; the American Association of Colleges of Pharmacy; the American Society of Hospital Pharmacists; and the American College of Apothecaries. Arranged by Bernard E. Conley, American Medical Association. Bernard E. Conley will be moderator. Speakers: Wayland J. Hayes, Communicable Disease Center, U.S. Public Health Service, Savannah, Ga.; Lester M. Petrie, Georgia Department of Public Health, Atlanta; Irving Kerian, Food and Drug Administration, Washington, D.C.; Veronica L. Conley, Committee on Cosmetics, American Medical Association.

#### Industrial Science

*Resource Development through Science*, part I, "Scientific development of southern resources." Wednesday, 28 Dec., 9 A.M. Program of AAAS Section P-Industrial Science, cosponsored by AAAS Sections M-Engineering and K-Social and Economic Sciences and the Southern Association of Science and Industry. Arranged by Earle L. Rauber, Federal Reserve Bank of Atlanta. Earle L. Rauber will preside. Speakers: Lloyd Raisty, Federal Reserve Bank of Atlanta; E. L. Hendricks, U.S. Department of the Interior, Washington, D.C.; J. Wayne Reitz, University of Florida; Robert A. Laurence, U.S. Geological Survey, Knoxville, Tenn.

*Resource Development through Science*, part II, "Science in area development." Wednesday, 28 Dec., 2:15 P.M. Program of AAAS Section P-Industrial Science, cosponsored by AAAS Sections M-Engineering and K-Social and Economic Sciences and the Southern Association of Science and Industry. Arranged by Earle L. Rauber. H. M. Conway, Jr., Southern Association of Science and Industry, will preside. Speakers: Charles Hamman, Stanford Research Institute; Richard M. Alt, Arthur D. Little, Inc. Discussants: Clayton D. McLendon, Citizens and Southern National Bank; Frank Shaw, Atlanta Chamber of Commerce.

#### Education

*Developing Leaders in Science.* Monday, 26 Dec., 9 A.M. Joint session of AAAS Section Q-Education and the International Council for Exceptional Children. Arranged by Paul Witty, Northwestern University. Paul Witty will preside. Speakers: Paul Brandwein, Forest Hills High School, Forest Hills, N.Y.; Morris Meister, Bronx High School of

Science, New York; Walter Barbe, University of Chattanooga; Antonia Bell Morgan, Aptitude Associates, Inc., Merrifield, Va.; Madeleine F. Coutant, New York State Education Department, Albany; Robert D. MacCurdy, University of Florida.

*Education of the Gifted.* Monday, 26 Dec., 2 P.M. Joint session of AAAS Section Q-Education and the International Council for Exceptional Children. Arranged by Paul Witty. Paul Witty will preside. Speakers: Walter Barbe; Paul Brandwein; Madeleine F. Coutant; Morris Meister; Antonia Bell Morgan; D. A. Worcester, University of Nebraska.

*The Role of Evaluation in the Improvement of Policies and Practices in Institutions of Higher Learning.* Tuesday, 27 Dec., 9 A.M. Joint session of AAAS Section Q-Education and the American Educational Research Association. Arranged by James E. Greene, University of Georgia. Rufus E. Clement, Atlanta University, will preside. Speakers: Ralph F. Berdie, University of Minnesota; William Coleman, University of Tennessee; James E. Greene; Paul I. Clifford, Atlanta University; Wesley W. Walton, Educational Testing Service, Princeton, N.J.; A. J. Brumbaugh, Southern Regional Educational Board.

*The Coordination of Science and Education.* Tuesday, 27 Dec., 2 P.M. Program of the National Association of Biology Teachers. Edna Higbee, NABT, Pittsburgh, Pa., will preside. Speakers: Ned E. Bingham, University of Florida; Victor A. Greulich, University of North Carolina. Panel discussion: "Progress report of the implementation of the recommendations of the Southeastern Conference on Biology Teaching." George W. Jeffers, Longwood College, will be moderator. Panel members from state teams follow. Alabama: P. H. Yancey, Spring Hill College; Florida: W. Hugh Stickler, Florida State University; Georgia: W. B. Baker, Emory University; Kentucky: William B. Owsley, Morehead State College; Louisiana: W. G. Erwin, Northwestern State College; Mississippi: R. L. Caylor, Delta State College; North Carolina: F. Ray Derrick, Appalachian State Teachers College; South Carolina: Harry W. Freman, University of South Carolina; Tennessee: W. W. Wyatt, University of Tennessee; Virginia: G. W. Jeffers, Longwood College.

*Attracting Secondary Students into Science.* Demonstration lectures in five areas of the physical sciences. Tuesday, 27 Dec., 2 P.M. Program of the National Science Teachers Association. Arranged by Katherine Hertzka, Hoke Smith High School and Josie Slocumb and Annie Sue Brown, Atlanta Public Schools. John S. Richardson, NSTA, Ohio State University, will preside. Speakers: S. M. Christian, R.C.A. Laboratories,

Princeton, N. J.; Robert T. Lagemann, Vanderbilt University; James G. Lester, Emory University; J. A. Stanfield, Georgia Institute of Technology; William H. Jones, Emory University.

*Science and Human Resources.* Wednesday, 28 Dec., 9 A.M. Joint session of the National Association of Biology Teachers, National Science Teachers Association, and the American Nature Study Society. Arranged by John P. Harrold, NABT, Midland, Mich., and Frances Hall, NABT, Atlanta, Ga. Brother H. Charles, F. S. C., NABT, St. Mary's College, Winona, Minn., will preside. Speakers: Robert B. Platt, Emory University; J. W. Kercheval, Iowa State Teachers College; E. K. Weaver, Atlanta University; Donald Martin, U.S. Communicable Disease Center, Chamblee, Ga.

*Recent Research in Science Education.* Wednesday, 28 Dec., 2 P.M. Program of the National Association for Research in Science Teaching, cosponsored by the National Science Teachers Association, National Association of Biology Teachers, Central Association of Science and Mathematics Teachers, American Educational Research Association, American Nature Study Society, International Council for Exceptional Children, AAAS Section Q-Education, and the AAAS Cooperative Committee on the Teaching of Science and Mathematics. Arranged by George G. Mallinson, Western Michigan College. Waldo W. E. Blanchet, Fort Valley State College, will preside. Speakers: Clark Hubler, Wheelock College; Julian Greenlee, Florida State University; Jacqueline Buck Mallinson, Kalamazoo, Michigan; Hubert Evans, Teachers College, Columbia University; Edward K. Weaver, Atlanta University; Woolford B. Baker, Emory University; George G. Mallinson.

*What University and College Science Departments Can Do about Their Responsibility for Teacher Education.* Thursday, 29 Dec., 8 P.M. Program of the AAAS Cooperative Committee on the Teaching of Science and Mathematics, cosponsored by AAAS Section A-Mathematics. Arranged by John R. Mayor, AAAS. Panel members: E. A. Cameron, University of North Carolina; A. B. Garrett, Ohio State University; George G. Mallinson, Western Michigan College; John R. Mayor; Walter M. Nielson, Duke University; Howard M. Phillips, Emory University.

#### Science in General

*Southern Agriculture from 1913 to 1956.* Tuesday, 27 Dec., 9 A.M. Joint session of the National Association of Biology Teachers, National Science Teachers Association, and the American Nature Study Society. Arranged by Malvina Trussell, ANSS, Florida State

University. Malvina Trussell will preside. Speakers: George H. King, Agricultural Experiment Stations, University of Georgia; S. G. Chandler, University of Georgia Extension Service; Herbert L. Stoddard, Sr., Thomasville, Ga.; Ed Komarek, Greenwood Farms, Thomasville, Ga.; J. W. Fanning, University of Georgia.

*The Nature Study Idea and Its Contribution to the School Program.* Tuesday, 27 Dec., 2 P.M. Program of the American Nature Study Society. Arranged by Malvina Trussell, Florida State University. W. B. Baker, Emory University, will preside. Speakers: E. Laurence Palmer, National Wildlife Federation of American Nature Association; Walter Thurber, State University of New York, State Teachers College, Cortland; Helen Boer, Tallahassee, Florida; Stanley Mulaik, University of Utah.

*Inside the Salk Story.* Tuesday, 27 Dec., 4 P.M. Program of the National Association of Science Writers. Arranged by Odom Fanning, Bradford D. Ansley, Edwina Davis, and Katherine Barnwell. Roland H. Berg will preside. Speakers: Earl Ubell, *The New York Herald Tribune*; Greer Williams, Chicago, Ill.; Dorothy Ducas, National Foundation for Infantile Paralysis; Cleland B. Wyllie, University of Michigan News Service.

*The Appeal of the Nature Writer to All Age Groups.* Thursday, 29 Dec., 2 P.M. Program of the American Nature Study Society. Arranged by Malvina Trussell, Florida State University. Richard L. Weaver, University of Michigan, will preside. Speakers: Roger Tory Peterson, Editor, Field Guide Series, Old Lyme, Conn.; Herbert S. Zim, University of Illinois; Millicent E. Selsam; Ed Dodd; Charles E. Mohr, Audubon Nature Center, Greenwich, Conn.

*Conference on Scientific Editorial Problems.* The cochairmen of the third conference on scientific editorial problems are Marian Fineman, Editorial Branch, Dugway Proving Ground, Dugway, Utah; A. E. Tyler, Technical Publishing Society, Los Angeles, Calif.; and Robert W. Russell, Engineering Center, University of Southern California.

1) Opening plenary session. Wednesday, 28 Dec., 10 A.M. A. E. Tyler will preside. Speaker: Saul Herner.

2) "Scientific and technical writing: organization of material." Wednesday, 28 Dec., 2 P.M. Arranged by Paul H. Flint, Tufts University. Paul H. Flint will preside. Panel members: Frederick Ashenhurst and Richard Wiegand. Speaker: E. J. Megroth.

3) "Scientific and technical editing: editing of technical reports and manuals." Wednesday, 28 Dec., 2 P.M. Arranged by Milton O. Lee, Federation of American Societies for Experimental

Biology. Milton O. Lee will preside. Panel members: to be announced. Speaker: John Wilson.

4) "Storage and retrieval of scientific and technical information: trends in scientific and technical documentation." Wednesday, 28 Dec., 2 P.M. Arranged by Scott Adams, American Documentation Institute. James W. Perry, Western Reserve University, will preside. Panel members: Madeline M. Berry, Bernard M. Fry, Eugene Jackson, John W. Kuipers, and Ralph R. Shaw. Speakers: Eugene Garfield and S. N. Alexander.

5) "Graphic methods in the communication of scientific and technical information." Wednesday, 28 Dec., 2 P.M., and Thursday, 29 Dec., 9 A.M. Arranged by J. G. Adashko, Ford Instrument Company, Long Island City, N.Y. J. G. Adashko will preside. Panel members: I. Hartley, W. W. Holler, J. E. Levy, H. E. Marschalk, L. E. Neville.

6) "Scientific and technical editing: management of publications." Wednesday, 28 Dec., 2 P.M., and Thursday, 29 Dec., 9 A.M. Arranged by C. M. Johnson, U.S. Navy Electronics Laboratory, San Diego, Calif. C. M. Johnson will preside. Panel members: A. M. Glazoe, Dwight E. Gray, Martin E. Jansson, G. M. Johnson, Howard R. Kennedy, Alberto F. Thompson. Speaker: Dwight E. Gray.

7) "Scientific and technical writing: the audience." Thursday, 29 Dec., 9 A.M. Arranged by Paul H. Flint. Paul H. Flint will preside. Panel members: Frederick Ashenhurst and Richard Wiegand. Speaker: Jay R. Gould.

8) "Scientific and technical editing: editing of scientific journals." Thursday, 29 Dec., 9 A.M. Arranged by Milton O. Lee. Milton O. Lee will preside. Panel members: Bentley Glass, Robert R. Davis, Albert Noyes, Mina S. Rees, Graham DuShane, and David Goddard. Speaker: Wallace R. Brode.

9) Closing plenary session. Thursday, 29 Dec., 2 P.M. A. E. Tyler will preside. Speaker: A. N. Spence.

*The Crisis in Science Education.* Thursday, 29 Dec., 9 A.M. George W. Beadle, chairman, Division of Biology, California Institute of Technology, and president of the AAAS, will be chairman. Speakers: Charles Dollard, Arthur S. Flemming, and Alan T. Waterman.

#### Vice Presidential Addresses

Vice presidential addresses have been scheduled as follows:

C—Chemistry. Robert S. Ingols, "Chlorination of water," Tuesday evening, 27 Dec.

D—Astronomy. Gerald M. Clemence, "Standards of time and frequency," Thursday evening, 29 Dec.

E—Geology and Geography. Wallace W. Atwood, Jr., "United States participation in international science," Tuesday evening, 27 Dec.

F—Zoological Sciences. J. Gordon Carlson, "Some observations on the mitotic movements of chromosomes," Thursday evening, 29 Dec.

G—Botanical Sciences. Lawrence R. Blinks, "Flora et fauna potomacensis," Wednesday evening, 28 Dec.

I—Psychology. S. S. Stevens, "The theory and uses of scales of sensation," Tuesday afternoon, 27 Dec.

L—History and Philosophy of Science. Raymond J. Seeger, "Man and science," Friday afternoon, 30 Dec.

N—Medical Sciences. S. E. Luria, "Infectious heredity and its medical applications," Wednesday afternoon, 28 Dec.

P—Industrial Science. George L. Parkhurst, "The chemical industry and its raw materials," Wednesday noon, 28 Dec.

Q—Education. Carter V. Good, "The role of values in educational and social research," Wednesday morning, 28 Dec.

#### AAAS Business Sessions

The board of directors of the Association will meet at 9:30 A.M., Tuesday, 27 Dec., in a private suite at the Hotel Dinkler Plaza. Dates and hours of subsequent sessions of the Board of Directors during the meeting will be decided at this first session.

The council of the association will meet Tuesday, 27 Dec., at 4 P.M., in the Rainbow Roof, Hotel Dinkler Plaza. A second session of the council is scheduled for Friday, 30 Dec., at 9 A.M., in the same room, at which time the council will take up the question of what organized science can do about the shortage of science teachers and students. All members of the council have been notified individually, and it is hoped that all can attend. Subjects to be considered by the council (in addition to the agenda prepared) usually are first brought before the board of directors through the administrative secretary. During the meeting, communications for the board of directors should be addressed to Dael Wolfe and left at the Hotel Dinkler Plaza mail desk.

All section chairmen and section secretaries will meet Friday, 30 Dec., at 12 noon in the Central YMCA, 145 Luckie St. N.W., for luncheon and a business meeting. Dael Wolfe and Raymond L. Taylor will be cochairmen.

#### AAAS Science Theatre Programs

The AAAS Science Theatre, a permanent feature of the Association's annual



meeting, presents showing of the latest domestic and foreign scientific films—all with sound—throughout the meeting period. In the following schedule, programs are both repeated and transposed to increase the opportunities for those attending the sessions of the 122nd meeting to see particular films. Most titles—but not all—will be shown twice. The Association is greatly indebted to all those who made these pictures and lent them for showing.

The AAAS Science Theatre will be in the Municipal Auditorium near the Annual Exposition of Science and Industry.

**Admission to the Science Theatre.** The Science Theatre is a feature for the pleasure and information of all registrants attending the annual meeting; it is deemed well worth the considerable cost of projection. It cannot be for the casual passerby; thus admission is restricted to those who wear the AAAS Convention Badge.

**Hours of the Science Theatre** are 9 A.M. to 1 P.M. and 2 P.M. to 6 P.M. on Tuesday and Wednesday, 27–28 Dec.; 1 P.M. to 5 P.M. on Thursday, 29 Dec.; and 9 A.M. to 1 P.M. and 1 P.M. to 4 P.M. on Friday, 30 Dec.

#### 27 December, Morning

**The Story of Light.** General Electric Co. Color; 10 min.

**American Flamingo.** Produced in cooperation with the National Audubon Society by Carlin Films, Inc. Color; 14 min.

**Bronchopulmonary Segments, Part I: Anatomy and Bronchoscopy.** Chevalier L. Jackson, John Franklin Huber, and Charles M. Norris, Temple University, and Pfizer Laboratories. Color; 31 min.

**The World That Nature Forgot.** Monsanto Chemical Co. Color; 30 min.

**Magic Pathway.** Produced by Prosnern-Barnes Productions, Inc.; distributed by Movies, U.S.A., Inc. Color; 21 min.

**Man Is A Universe.** National Film Board of Canada. 12 min.

**Animals Unlimited.** Films of the Nations Distributors, Inc. Color; 20 min.

**The Way of the Navaho.** Columbia Broadcasting System, Inc.—“Adventure” television program; Department of News and Public Affairs. 33 min.

**Glass and You.** Corning Glass Works; distributed by Association Films, Inc. Color; 29 min.

**Pipeline to the Clouds.** General Electric Co. Color; 25 min.

#### 27 December, Afternoon

**Look to the Sea.** Joseph M. Rowland and Donn Hale Munson, Glenn L. Martin Aircraft Corp. Color; 15 min.

**Horizons of Hope.** Produced by John Sutherland Productions; distributed by Movies, U.S.A., Inc. Color; 18 min.

**Animal Language.** Columbia Broadcasting System, Inc.—“Adventure” television program; Department of News and Public Affairs. 29 min.

**Eye to the Unknown.** Consolidated Engineering Corp. Color; 33 min.

**Birth of a Florida Key.** Films of the Nations Distributors, Inc. Color; 14 min.

**The Nike.** American Telephone and Telegraph Co. 10 min.

**Louisiana Story.** Robert J. Flaherty's last film; distributed by Contemporary Films, Inc. 77 min.

**Embryology of Human Behavior.** Produced by the Medical Audio-Visual Institute of the Association of American Medical Colleges; distributed by International Film Bureau, Inc. Color; 28 min.

#### 28 December, Morning

**Atomic Tests in Nevada.** U.S. Air Force for the U.S. Atomic Energy Commission. Color; 25 min.

**Interim Report.** National Foundation for Infantile Paralysis. 15 min.

**Blue Ice.** Australian News and Information Bureau. Color; 30 min.

**Waltzing Mice.** Sandoz Pharmaceuticals. Color; 15 min.

**The Suspension Bridge.** U.S. Steel Corp. Color; 26 min.

**King Cobra—Kills! Cures?** Emerson Yorke Studio; distributed by Young America Films, Inc. 15 min.

**Horizon Unlimited.** Joseph M. Rowland and Donn Hale Munson, Glenn L. Martin Aircraft Corp. Color; 15 min.

**Upper Extremity Prosthetic Principles.** Veterans Administration. Color; 27 min.

**Yosemite: End of the Rainbow.** Produced by Guy Haselton; distributed by Bailey Films, Inc. Color; 22 min.

**Four-Wheel Test Tube.** General Motors Corp. Color; 10 min.

**Too Young to Say.** Produced by the University of Southern California on a grant from the Beltone Hearing Aid Co. Color; 14 min.

**Thunderbolt Hunters.** General Electric Co. 10 min.

#### 28 December, Afternoon

**The Waiting Harvest.** U.S. Steel Corp. Color; 23 min.

**Pitfalls in Management of Refractory Heart Failure.** Medical Film Guild Ltd. Color; 35 min.

**Music in Motion.** American Telephone and Telegraph Co. Color; 18 min.

**The Effect of Serpasil (Reserpine) on Monkeys.** Produced by CIBA Pharmaceutical Products, Inc. with technical assistance by Sturgis-Grant Products, Inc. Color; 15 min.

**Navy Photography in Science.** U.S. Navy. Color; 28 min.

**Children With Nephrosis.** Robert E. Cooke, Yale University School of Med-

icine, for the Medical Advisory Board, National Nephrosis Foundation, Inc.; produced by Campus Film Productions, Inc., with Leo L. Leveridge, Medical Film Department, Pfizer Laboratories. Color; 13 min.

**Safe Passage.** Raytheon Manufacturing Co. Color; 19 min.

**A Cinematographic Study of the Function of the Mitral Valve in situ.** Authors: Elliott S. Hurwitt, Adrian Kantrowitz, and Antol Herskovitz, Montefiore Hospital, New York; revised for teaching with the assistance of Leo L. Leveridge, Medical Audio-Visual Institute of the Association of American Medical Colleges. Color; 13 min.

**The Young City.** Produced by the Municipality of Vienna, Austria; distributed by E. J. Mauthner, New York. 55 min.

#### 29 December, Afternoon

**Pipeline to the Clouds.** General Electric Co. Color; 25 min.

**Glass and You.** Corning Glass Works; distributed by Association Films, Inc. Color; 29 min.

**The Way of the Navaho.** Columbia Broadcasting System, Inc.—“Adventure” television program; Department of News and Public Affairs. 33 min.

**Animals Unlimited.** Films of the Nations Distributors, Inc. Color; 20 min.

**Man Is A Universe.** National Film Board of Canada. 12 min.

**Magic Pathway.** Produced by Prosnern-Barnes Productions, Inc.; distributed by Movies, U.S.A., Inc. Color; 21 min.

**The World That Nature Forgot.** Monsanto Chemical Co. Color; 30 min.

**Bronchopulmonary Segments, Part I: Anatomy and Bronchoscopy.** Chevalier L. Jackson, John Franklin Huber, and Charles M. Norris, Temple University, and Pfizer Laboratories. Color; 31 min.

**American Flamingo.** Produced in cooperation with the National Audubon Society by Carlin Films, Inc. Color; 14 min.

**The Story of Light.** General Electric Co. Color; 10 min.

#### 30 December, Morning

**Embryology of Human Behavior.** Produced by the Medical Audio-Visual Institute of the Association of American Medical Colleges; distributed by International Film Bureau, Inc. Color; 28 min.

**Louisiana Story.** Robert J. Flaherty's last film; distributed by Contemporary Films, Inc. 77 min.

**The Nike.** American Telephone and Telegraph Co. 10 min.

**Birth of a Florida Key.** Films of the Nations Distributors, Inc. Color; 14 min.

**Eye to the Unknown.** Consolidated Engineering Corp. Color; 33 min.

*Animal Language.* Columbia Broadcasting System, Inc.—“Adventure” television program; Department of News and Public Affairs. 29 min.

*Horizons of Hope.* Produced by John Sutherland Productions; distributed by Movies, U.S.A., Inc. Color; 18 min.

*Look to the Sea.* Joseph M. Rowland and Donn Hale Munson, Glenn L. Martin Aircraft Corp. Color; 15 min.

#### 30 December, Afternoon

*Too Young to Say.* Produced by the University of Southern California on a grant from the Beltone Hearing Aid Co. Color; 14 min.

*Four-Wheel Test Tube.* General Motors Corp. Color; 10 min.

*Yosemite: End of the Rainbow.* Produced by Guy Haselton; distributed by Bailey Films, Inc. Color; 22 min.

*Horizon Unlimited.* Joseph M. Rowland and Donn Hale Munson, Glenn L. Martin Aircraft Corp. Color; 15 min.

*King Cobra—Kills! Cures?* Emerson Yorke Studio; distributed by Young America Films, Inc. 15 min.

*Waltzing Mice.* Sandoz Pharmaceuticals. Color; 15 min.

*Blue Ice.* Australian News and Information Bureau. Color; 30 min.

*Interim Report.* National Foundation for Infantile Paralysis. 15 min.

*Atomic Tests in Nevada.* U.S. Air Force for the U.S. Atomic Energy Commission. Color; 25 min.

#### Participating Societies and Organizations

##### Physics

American Meteorological Society  
Oak Ridge Institute of Nuclear Studies  
Sigma Pi Sigma

##### Chemistry

Alpha Chi Sigma  
American Association of Clinical Chemists  
American Chemical Society, Georgia Section

##### Astronomy

Astronomical League  
Atlanta Astronomy Club

##### Geology and Geography

Association of American Geographers, Southeastern Division  
Geological Society of America  
National Geographic Society  
National Speleological Society

##### Zoological Sciences

American Society of Parasitologists  
American Society of Zoologists  
Herpetologists League  
Society of Systematic Zoology

##### Zoological and Botanical Sciences

American Society of Naturalists  
Association of Southeastern Biologists  
Ecological Society of America  
Genetics Society of America

Mountain Lake Biological Station  
National Association of Biology Teachers  
Society of General Physiologists  
Society of Marine Borer Chemists and Biologists

##### Botanical Sciences

American Phytopathological Society  
American Phytopathological Society, Southern Division  
American Society of Plant Physiologists, Southern Section  
Botanical Society of America, Southeastern Section

##### Psychology

Society for Research in Child Development  
Southern Society for Philosophy and Psychology

##### Social and Economic Sciences

National Academy of Economics and Political Science  
Pi Gamma Mu  
Southern Political Science Association

##### History and Philosophy of Science

History of Science Society  
Philosophy of Science Association  
Society for the Advancement of General Systems Theory

##### Medical Sciences

Alpha Epsilon Delta, National Premedical Honor Society  
American Association of Hospital Consultants  
American Physiological Society  
American Psychiatric Association

##### Dentistry

American College of Dentists  
American Dental Association  
International Association for Dental Research, North American Division

##### Pharmacy

American Association of Colleges of Pharmacy  
American College of Apothecaries  
American Pharmaceutical Association, Scientific Section  
American Society of Hospital Pharmacists

##### Industrial Science

Southern Association of Science and Industry

##### Education

AAAS Cooperative Committee on the Teaching of Science and Mathematics  
American Educational Research Association  
Central Association of Science and Mathematics Teachers  
International Council for Exceptional Children  
National Association for Research in Science Teaching  
National Science Teachers Association

##### Science in General

Academy Conference  
American Geophysical Union  
American Nature Study Society  
Conference on Scientific Editorial Problems

Conference on Scientific Manpower  
Georgia Academy of Science  
International Geophysical Year  
National Association of Science Writers  
National Academy of Sciences—National Research Council  
National Science Foundation  
Scientific Research Society of America  
Sigma Delta Epsilon  
Society of the Sigma Xi  
United Chapters of Phi Beta Kappa

#### Atlanta Committees

As is rather generally recognized, it would be quite impossible successfully to arrange a large and complex meeting and to carry it through to a conclusion, successful in all respects, if it were not for the devoted services of many local scientists and other members and friends of the Association. They merit the unstinted appreciation of all who attend. It is noteworthy that James V. Carmichael accepted the general chairmanship of the Atlanta meeting in the spring of 1954, appointed the local committees early, and has kept in close touch with all phases of this year's meeting.

##### General Chairman

James V. Carmichael, president, Scripto, Incorporated, Atlanta.

##### General Vice Chairman

Robert S. Lynch, president, Atlantic Steel Co., Atlanta.

##### Vice Chairmen

George C. Biggers, Sr., president, Atlanta Newspapers, Inc.

Fred J. Turner, president, Southern Bell Telephone and Telegraph Co., Atlanta.

D. J. Haughton, vice president and general manager, Georgia Division, Lockheed Aircraft Corp., Marietta.

##### Executive Secretary

Bradford D. Ansley, public relations director, Emory University.

##### General Committee

James V. Carmichael, president, Scripto, Incorporated, *chairman*.

Robert S. Lynch, president, Atlantic Steel Co., *vice chairman*.

O. C. Aderhold, president, University of Georgia.

Allen D. Albert, Jr., president, Atlanta Art Association.

Wallace M. Alston, president, Agnes Scott College.

Howard M. Barker, regional sales manager, Taylor Instrument Co.

George C. Biggers, Sr., president, Atlanta Newspapers, Inc.

Joseph Earle Birnie, president, Bank of Georgia.

William H. Bolte, plant manager, General Motors Assembly Plant.

Harilee Branch, Jr., president, Georgia Power Company.

Malcolm Bryan, president, Federal Reserve Bank of Atlanta.

Harmon Caldwell, chancellor, University System of Georgia.

C. Howard Candler, Jr., Asa G. Candler, Inc.

Clinton D. Castleberry, president, Atlantic Co.

Jim Cherry, superintendent, DeKalb County Schools.

Rufus E. Clement, president, Atlanta University.

Erle Cocke, Sr., vice chairman of the board, Fulton National Bank.

Richard W. Courts, partner, Courts and Company.

Norman E. Elsas, chairman of the board, Fulton Bag and Cotton Mills.

M. A. Ferst, president, M. A. Ferst, Ltd.

E. Smythe Gambrell, attorney; president, American Bar Association.

George E. Glenn, Jr., president, Exposition Cotton Mills.

Hix H. Green, president, Hix Green Buick Company.

Marvin Griffin, Governor of Georgia.

William B. Hartsfield, mayor, City of Atlanta.

D. J. Haughton, vice president and general manager, Georgia Division, Lockheed Aircraft Corp.

Marion Hines, professor of experimental anatomy, Emory University.

Charles H. Jagels, president, Davison-Paxon Co.

Ira Jarrell, superintendent, Atlanta School System.

Charles H. Kellstadt, vice president, Sears Roebuck and Co.

Mills B. Lane, Jr., president, Citizens and Southern National Bank.

Albert E. Manley, president, Spelman College.

Evangeline Papageorge, associate professor of biochemistry, Emory University.

William L. Pressly, president, Westminster Schools.

Richard H. Rich, president, Rich's, Inc.

Arthur P. Richardson, director, division of basic sciences in the health services, Emory University.

L. W. Robert, Jr., chairman of the board, Robert and Company Associates.

James D. Robinson, Jr., chairman of the board, First National Bank of Atlanta.

Jane Russell, associate professor of biochemistry, Emory University.

Randall G. Satterwhite, general manager, Eastman Kodak Co.

Joseph Seitz, president, Colonial Stores, Inc.

George Seward, acting president, Oglethorpe University.

B. L. Shackleford, president, Fulton County Medical Society.

John A. Sibley, chairman of the board, Trust Company of Georgia.

George C. Sparks, president, Georgia State College of Business Administration.

Herman Talmadge, attorney.

Fred J. Turner, president, Southern Bell Telephone and Telegraph Co., Atlanta.

Blake R. Van Leer, president, Georgia Institute of Technology.

Paul West, superintendent, Fulton County Schools.

Goodrich C. White, president, Emory University.

R. Hugh Wood, dean, School of Medicine, Emory University.

George W. Woodruff, chairman of the board, Continental Gin Co.

Robert W. Woodruff, chairman, finance committee, Coca-Cola Co., Atlanta.

C. E. Woolman, president and general manager, Delta-Chicago and Southern Airlines.

S. R. Young, president, Atlanta-West Point and Georgia Railroad.

#### Committee on Exhibits

D. J. Haughton, vice president and general manager, Georgia Division, Lockheed Aircraft Corp., Marietta, *chairman*.

Thomas T. Dunn, vice president, Union Bag and Paper Corp., Savannah.

Theodore M. Forbes, executive vice president, Cotton Manufacturers Association of Georgia, Atlanta.

Edgar J. Forio, vice president, Coca-Cola Co., Atlanta.

Donald M. Hastings, Sr., president, H. G. Hastings Co., Atlanta, and president, Atlanta Chamber of Commerce.

Charles K. Lovejoy, executive vice president, Scripto, Inc., Atlanta, and president and chairman of the board, Associated Industries of Georgia.

Jack J. McDonough, executive vice president, Georgia Power Company, Atlanta, and president, Georgia State Chamber of Commerce.

R. R. Kearton, assistant general manager, Georgia Division, Lockheed Aircraft Corp., Marietta.

#### Committee on Finance

Fred J. Turner, president, Southern Bell Telephone and Telegraph Co., *chairman*.

Allen D. Albert, Jr., president, Atlanta Art Association.

Joseph Earle Birnie, president, Bank of Georgia.

Hix H. Green, president, Hix Green Buick Co.

Jack J. McDonough, executive vice president, Georgia Power Company, Atlanta, and president, Georgia State Chamber of Commerce.

William L. Pressly, president, Westminster Schools.

George C. Sparks, president, Georgia State College of Business Administration.

Paul West, superintendent, Fulton County Schools.

#### Committee on Physical Arrangements

Walter S. Bell, Department of Audio-Visual Education, Atlanta Board of Education, *chairman*.

Garland Bagley, Georgia State Department of Education.

Alice Bohannon, DeKalb County Public School System.

Woodrow Breeland, Georgia State College of Business Administration.

Albert Cox, teaching aids, Emory University.

Mrs. C. W. Dieckman, Decatur Public School System.

Edward Garrett, Georgia Institute of Technology.

Edward Kendrick, Cobb County Board of Education.

Kathleen Moon, Fulton County Public School System.

Katharine T. Omwake, Agnes Scott College.

Harry Sherrell, Communicable Disease Center, U.S. Public Health Service.

Bailey M. Wade, Georgia State College of Business Administration.

George Wheeler, Oglethorpe University.

#### Committee on Public Relations

George C. Biggers, Sr., president, Atlanta Newspapers, Inc., *chairman*.

Frank Ashmore, public relations, Emory University.

Harry Backer, public relations, General Electric Co.

James Saxon Childers, editor, *The Atlanta Journal*.

Odom Fanning, Midwest Research Institute, Kansas City, Mo.

Murray C. Fincher, public relations, Southern Bell Telephone and Telegraph Co.

Edgar J. Forio, vice president, Coca-Cola Co.

Ralph McGill, editor, *The Atlanta Constitution*.

Frank Palotta, Rich's, Inc.

Lee Rogers, public information, Lockheed Aircraft Corp., Marietta.

Philip G. Rozelle, public relations, General Motors Corp.

George M. Stenhouse, information officer, Communicable Disease Center, U.S. Public Health Service, Atlanta.

Julian Trivers, vice president, Davison-Paxon Co.

Robert B. Wallace, Jr., head of publication services, Engineering Experiment Station, Georgia Institute of Technology.

Winifred Lee Wilkinson, Candler Building, Atlanta.

Dick Young, public relations, Ford Motor Co.

#### Hotel Headquarters

The Hotel Dinkler Plaza is the official headquarters of the AAAS; it is where the council of the Association will meet

and where other business sessions will be held. The Press Room—for receipt of authors' abstracts and the only source of press releases—is in the Mahogany Room on the mezzanine floor, one flight above the lobby.

The Main Registration-Information Center, the Visible Directory of Registrants, the AAAS Office, the AAAS Science Theatre, and the Annual Exposition of Science and Industry are all in the Municipal Auditorium on Courtland St., between Edgewood Ave. and Gilmer St., within easy walking distance of the downtown hotels but also served by AAAS buses.

The headquarters of the 17 sections and participating societies follow (the societies are grouped in the same sequence as the letters of the sections with which they are affiliated or associated).

#### Downtown Zone

**Dinkler Plaza.** AAAS; Press; AAAS Sections F, I, Q; American Society of Parasitologists, American Society of Zoologists, Herpetologists League, Society of Systematic Zoology; American Society of Naturalists, Association of South-eastern Biologists, Ecological Society of America, Genetics Society of America, Mountain Lake Biological Station, National Association of Biology Teachers, Society of General Physiologists; Society for Research in Child Development, Southern Society for Philosophy and Psychology; AAAS Cooperative Committee on the Teaching of Science and Mathematics, American Educational Research Association, Central Association of Science and Mathematics Teachers, International Council for Exceptional Children, National Association for Research in Science Teaching, National Science Teachers Association; Academy Conference, American Nature Study Society, Conference on Scientific Editorial Problems, National Association of Science Writers, National Research Council, National Science Foundation, Scientific Research Society of America, Sigma Delta Epsilon, Society of the Sigma Xi, United Chapters of Phi Beta Kappa.

**Henry Grady.** AAAS Section C, N, Np; Alpha Chi Sigma, American Association of Clinical Chemists, American Chemical Society, Georgia Section; Alpha Epsilon Delta, American Association of Hospital Consultants, American Physiological Society, American Psychiatric Association; American Association of Colleges of Pharmacy, American College of Apothecaries, American Pharmaceutical Association, and American Society of Hospital Pharmacists.

**Peachtree on Peachtree.** AAAS Section E; Association of American Geographers, Geological Society of America, National Geographic Society.

**Piedmont.** National Speleological So-

ciety; Society of Marine Borer Chemists and Biologists.

**Georgia.** AAAS Section Nd; American College of Dentists, American Dental Association, International Association for Dental Research, American Division.

Other hotels in the downtown zone are the *Atlantan, Hampton, Imperial, Jefferson, Royal, Savoy, and the University Motel.*

#### Georgia Tech Zone

**Atlanta Biltmore.** AAAS Sections A, B, D, G, M, O; American Meteorological Society, Oak Ridge Institute of Nuclear Studies, Sigma Pi Sigma; Astronomical League; American Phytopathological Society, APS, Southern Division, American Society of Plant Physiologists, Southern Section, Botanical Society of America, Southeastern Section; visiting members Association of Southern Agricultural Workers; American Geophysical Union, International Geophysical Year, Conference on Scientific Manpower.

**Georgian Terrace.** AAAS Sections K, L, P; National Academy of Economics and Political Science, Pi Gamma Mu, Southern Political Science Association; History of Science Society, Philosophy of Science Association, Society for the Advancement of General Systems Theory; Southern Association of Science and Industry.

Other hotels in the Georgia Tech zone are the *Cox-Carlton* and the *Peachtree Manor.*

#### Registration

**Main registration-information center.** The Main Registration-Information Center will be located in the lobby of the Municipal Auditorium, the entrance to which is on Courtland St. It will be open daily, 26-30 Dec. 8 A.M. to 8 P.M. except Thursday evening, 29 Dec., when it will remain open until 11 P.M. to accommodate any nonregistrants who wish to attend the Biologists' smoker, which is for all registrants.

Badges and General Programs may also be obtained at the supplementary registration desks, but the Main Registration is the only place to receive supplementary literature, maps, and the like. Advance Registrants (who will have received programs and badges prior to the meeting) are urged to visit the Main Registration at any convenient time to receive these items.

**Supplementary registration desks.** For the convenience of those attending the meeting, there are two supplementary registration desks as follows: (i) Hotel Dinkler Plaza, open 26 Dec. from noon until 9 P.M. and open 27-29 Dec. from 8 A.M. until 8 P.M. (ii) Hotel Atlanta Biltmore, open 27 Dec. from 9 A.M. until

9 P.M., open 28 Dec. from 8 A.M. until 8 P.M., and open 29 Dec. from 8 A.M. until 1 P.M.

**Registration fee.** The AAAS registration fee for all persons is \$2.50. Each registrant receives a receipt, a convention badge, and the book-size General Program-Directory—the only publication with the programs of the 17 AAAS Sections and of the 68 participating organizations. Any person who purchases an advance copy of the General Program-Directory but does not register in advance and who then attends the meeting agrees to complete his registration—and is expected to do so—at the Main Registration Center or at one of the two supplementary registration desks, after which he will receive his convention badge and the privileges that go with it.

It is essential that each person who attends the meeting support it by paying the registration fee of \$2.50, which, intentionally, has been kept at a minimum. When the costs of the program and badge are deducted, the net contribution toward general expenses is less than \$1 per registrant.

**AAAS convention badge.** The AAAS convention badge indicates that you have paid your share of the expenses of the meeting and that you are a complete participant in this 122nd convention of the Association. The badge should be worn throughout the meeting because (i) it reminds others to register; (ii) it is needed for admission to the AAAS Science Theatre and the Biologists' smoker; and, not least, (iii) it helps your friends to find you.

**Visible Directory of Registrants.** The much-consulted Visible Directory of Registrants, for the maximum convenience of all, will be located in the Municipal Auditorium near the Annual Exposition of Science and Industry. The hours it will be open correspond exactly with the hours the Main Registration is open—daily 8 A.M. to 8 P.M. The registration cards of all registrants are placed in the Visible Directory as soon as possible after registration. The arrangement is alphabetical. The cards of advance registrants will be completely alphabetized and typed since they will have been posted in Washington prior to the meeting; all other registration cards are filed to the second or third letter of the surname (Ba, Be, and so forth). Members of the press, exhibitor personnel, and guests are included in the Visible Directory—on blue cards instead of yellow. Registrants will find the Visible Directory invaluable in determining the convention addresses of friends attending the meeting.

**Mail, telegrams, and messages.** Mail and telegrams addressed in care of the AAAS will be held at the AAAS Office in the Municipal Auditorium. Efforts



will be made to notify addressees listed in the Visible Directory, but the Association assumes no responsibility for the delivery of mail or of telegrams. Telephone and personal messages will be filed alphabetically in the AAAS Office and the names for whom they are intended will be posted on a bulletin board.

**Society meal function tickets.** Tickets to the dinners or luncheons of any participating society are obtainable only from representatives of that society, either during or preceding sessions of that society, or at the AAAS Information Center.

### Facilities for Eating

Throughout the meeting period, the food concession in the Municipal Auditorium will be open for light refreshments and the luncheon facilities of the State College of Business Administration, across the street, will also be available.

In addition to the hotel coffee shops and dining rooms, the restaurants and public eating places in Atlanta are so numerous and varied that it is not feasible to list them here. For those who are interested, however, data will be available at the AAAS Information Center in the Municipal Auditorium.

### Atlanta Municipal Auditorium

The attractive Municipal Auditorium, owned and operated by the City of Atlanta, is the usual site of all large conventions and expositions in the city. Located on Courtland St. between Gilmer St. and Edgewood Ave., six or seven short blocks from the downtown hotels, it faces Joel Hurt Park, a triangular-shaped half-block with an ornamental fountain and planting. Only the front entrance in the center of the auditorium will be used. Immediately inside this entrance is the Main Registration-Information Center, the Visible Directory of Registrants at the right, and the Exposition and Science Theatre straight ahead. The session room on the main floor is at the left; those downstairs and upstairs are reached by ramps.

**AAAS Chartered Buses Shuttle Service.** During the meeting period, the Association will operate regular Atlanta Transit Co. buses marked "AAAS" back and forth between the Atlanta Biltmore and the downtown hotels—and to and from the Municipal Auditorium and adjacent State College of Business Administration (formerly the Atlanta Division of the University of Georgia).

Immediately preceding the session periods, mornings and afternoons, these shuttle buses will leave the Atlanta Biltmore for downtown and Municipal Au-

ditorium-State College at 20 minute intervals. These and other buses will load and discharge passengers at the principal downtown hotels—in particular, with scheduled stops at the Henry Grady-Peachtree on Peachtree, and the Dinkler Plaza-Piedmont hotels—at 10 minute intervals.

On return, immediately following the session periods, this service will observe the same pattern and time intervals. During the session periods, the operating frequency will be approximately 40 minutes (Biltmore) and 20 minutes (downtown hotels), respectively. Fare 15 cents each way.

Extra buses will carry passengers between all hotels and the AAAS Address and Reception at Spelman College, Atlanta University, on the evening of 28 Dec. and to and from the Municipal Auditorium on the evening of the Biologists' smoker, 29 Dec., at the same 15-cent fare.

### Tours and Points of Interest

At this meeting there will be no formal tours sponsored by the AAAS as a whole, but certain participating societies have planned biological and geological field trips to Stone Mountain and vicinity, visits to the U.S. Public Health Service's Communicable Disease Center at Chamblee, to industrial plants, to Bradley Observatory at Agnes Scott College, and to events on other campuses in the city. It is anticipated however, that a number of those attending this second Atlanta meeting may wish to visit one or more of the other points of interest for which this metropolis is noted. Data will be available at the Main Registration-Information Center in the auditorium and various maps and booklets will be distributed to all registrants. Advance registrants should call for this material. Among the points of interest are the following:

Agnes Scott College; Atlanta Public Library; Atlanta University; Communicable Disease Center, U.S. Public Health Service; Cyclorama (Battle of Atlanta); Emory University; Emory University School of Dentistry; Georgia Institute of Technology; Grant Park; High Museum of Art; Historic Lamp Post; Kennesaw Mountain; Oglethorpe University; Park Forest Botanical Gardens; Southern College of Pharmacy; State Capitol and State Museum; State College of Business Administration; Zoo.

### AAAS Public Information Service

Each person who will deliver an address or present a paper at the Atlanta meeting is requested to provide the Association's Public Information Service with

100 copies of a nontechnical abstract of his paper. One hundred copies of complete manuscripts are also required of papers presented by (i) officers of the Association; (ii) officers and invited speakers who appear on the programs of the participating societies; and (iii) authors whose papers are particularly newsworthy. Most authors already have recognized the necessity of this procedure and have sent their material to the Association's Director of Public Information, Sidney S. Negus, Medical College of Virginia, Richmond. If you are an author of an address or paper and have not done this, please send to Dr. Negus, to arrive in Richmond on or before 15 Dec., 100 copies of your nontechnical abstract. If it is impossible for you to send this material to Richmond to arrive by 15 Dec. (and mails are much slower in the pre-Christmas period), then mail all your material to Dr. Negus—or deliver it to him in person—at the AAAS Press Room, Mahogany Room, on the mezzanine of the Hotel Dinkler Plaza, before or during the convention. As an aid to the Association's Public Information Service, please send copies of your abstract to your local newspapers with the time indicated when it is to be presented in Atlanta.

The necessity for the general public to be kept informed of the results of the scientific research which it supports, directly and indirectly, is quite evident. Organized science and the individual scientist must have the understanding and support of all. It is, of course, equally important that the advances of science be publicized with accuracy and clarity without sensationalism. Progress in this direction in recent years has been most gratifying, thanks largely to members of the National Association of Science Writers, other accredited science reporters, managing editors of American newspapers, and program managers of radio and television stations.

It is in the interest of accuracy and completeness that science writers frequently wish to discuss various research results with investigators. If you are asked to cooperate in this respect or to participate in a press conference, please do so not only for your own protection but for the benefit of science in general. Scores of science writers will be covering this meeting. News stories filed by the representatives of all the wire services will be published and broadcast throughout the entire civilized world. At no other scientific meeting are the facilities for the dissemination of the most recent findings in all branches of science so complete as they are at the great, diversified meetings of the AAAS.

This year, not only is the Association fortunate in the continued services of Dr. Negus, chairman of the department



of biochemistry, Medical College of Virginia, Richmond, but also in its Local Committee on Public Information, headed by George C. Biggers, Sr., president, Atlanta Newspapers, Inc.

#### AAAS Annual Exposition of Science and Industry

The AAAS Annual Exposition of Science and Industry, which dates back to 1924 (still earlier with certain pioneer exhibitors), has long been an important and integral part of the Association's annual meeting. It provides an outstanding opportunity for those who use the tools and materials of science to meet those who produce and distribute the same. The 1955 edition of the Exposition, housed in the Atlanta Municipal Auditorium, is up to the same high standard of previous years.

The exhibits include the latest and best in scientific books, instruments, and materials; they are on a scale, and with a diversity, not usually possible at the meeting of an individual society or group of societies in a single field of science. In addition to this "core" of the Exposition, a variety of organizations have special exhibits, and there are *technical* exhibits by large firms representative of the basic industries of the nation. Prominent concerns in the chemical, pharmaceutical, and other industries are sharing with the attending scientists some of their impressive technological accomplishments. The Exposition should not be missed by anyone who attends this 122nd meeting.

The Exposition is open to (i) all registrants attending the meeting; (ii) adults who have applied for, and received, complimentary tickets of admission.

The hours of the exposition are as follows: Tuesday, 27 Dec., 2 P.M. to 6 P.M.; Wednesday, 28 Dec., 9 A.M. to 5:30 P.M.; Thursday, 29 Dec., 9 A.M. to 5 P.M. and 7 P.M. to 9 P.M.; Friday, 30 Dec., 9 A.M. to 4 P.M.

#### AAAS New Member Service—Science—The Scientific Monthly

Booth 94. Whether or not one is a member of the American Association for the Advancement of Science, every person attending this meeting is cordially invited to visit the AAAS booth for information concerning the Association and its activities. Beyond the satisfaction of strengthening its work for science, for scientists, and for society by one's membership, there are demonstrable personal advantages in joining the Association.

Since its founding, in 1848, the Association has admitted to membership not only professional scientists but also other men and women who have a general interest in science, who wish to keep informed of the progress of science, and who would like to support the high pur-

poses of the one organization that represents *all* science. The New Member Service will be pleased to accommodate those who wish to join the Association as of January 1. Members conveniently can nominate others for membership.

Included in the annual dues of \$6.50 (for 1956), each member has a choice of a year of *Science*, the professional scientist's newsworthy, or *The Scientific Monthly* (or both for an additional \$3.50). Free sample copies of these two publications will be distributed and all not familiar with both magazines should visit this booth where Symposium Volumes and AAAS membership insignia are also on display. Prospective advertisers may obtain sample copies of the magazines and rate cards.

#### AAAS Traveling High School Science Libraries

Booth 95.

Academy Conference and Georgia Academy of Science  
Booths 79, 80, and 81.

American Optical Company,  
Instrument Division  
Booth 7.

American Tobacco Company, Inc.  
Booths 73 and 74. The Research Laboratory of the American Tobacco Company will demonstrate a completely automatic cigarette airflow meter. This is another in the line of unique quality control devices developed by its Instrument Division. This meter utilizes standard type slack diaphragm gages insensitive to temperature changes and is designed so that the vacuum applied to the cigarette is automatically controlled and the volume of air passing through it is read directly. Errors encountered in manually adjusted instruments are eliminated, resulting in ever closer control of quality in Lucky Strike, Pall Mall, and Herbert Tareyton cigarettes.

American Veterinary Medical Association  
Booths 38 and 39. The exhibit entitled "The care of laboratory animals" emphasizes the need for informing the public about the complex nature of laboratory animal care. It stresses the importance of budgeting for individuals with specialized training as managers of animal quarters. It relates the interest that the veterinary profession has in this type of endeavor, the formation of the AVMA Committee on Laboratory Animals, and the readiness on the part of the AVMA to cooperate in the solution of problems presented.

The exhibit lists some of the organizations interested in problems of animal care and some of their publications. It presents colored panoramas of some of the problem diseases found in laboratory animals and some exemplary cages.

#### Animal Welfare Institute

Booth 51. The Animal Welfare Institute booth exhibit will feature a new pub-

lication by the institute designed for use by science teachers in elementary schools and biology teachers in secondary schools. It is entitled "First aid and care of small animals" and is profusely illustrated with photographs by the author, Ernest P. Walker of the Smithsonian Institution and others. Copies will be distributed free to teachers. The exhibit will also include photographs of the ceremony at which the first Albert Schweitzer medal was awarded to Robert C. Bay for his outstanding efforts to advance the welfare of laboratory animals. Biologists may obtain free copies of the institute's manuals, "Basic care of experimental animals" and "Comfortable quarters for laboratory animals" at the booth.

#### Association of American University Presses

Booth 76. The university presses, leaders in the field of nonfiction, each year publish a large number of important titles. Many of these gain lasting recognition as reference books and college texts. Each press represented in the Association of American University Presses' exhibit at the 1955 AAAS Annual Exposition of Science and Industry is a separate publishing company producing technical, medical, and scholarly works as well as general books of vital interest to all Americans. This exhibit offers an opportunity to see the new books from various university presses.

#### Atlanta Chamber of Commerce

Booth 4. The exhibit of the Atlanta Chamber of Commerce will contain a selection of photographs of the various things and scenes in the Atlanta area that would interest visitors. In addition, there will be a tabulation and current information on the 22 technical and professional societies that have active chapters here.

#### C. A. Brinkmann & Co.

Booth 66. The Brinkmann exhibit at this year's AAAS meeting will feature a number of new developments that have not been shown before. Outstanding among these will be a newly introduced line of line-operated research pH meters, some of which will be suitable for connecting to a recorder. Also on display will be a coulometer, a rather novel analytic instrument that produces the necessary amount of reagent electrolytically while a determination is being made. Also on display will be a complete line of electrophoresis equipment including paper strip chambers, a device for continuous separation by paper electrophoresis, an automatic scanner, and a fraction collector. Furthermore, new developments in balances will be shown such as a high speed two-pan balance and riderless microbalances. Also on display will be a newly developed rotary Microtome that can be used for making sections from 0.1 micron thick to standard thicknesses be-

tween 1 and 40 microns. Thus, this Microtome for the first time will be suitable for the preparation of samples for either electron or light microscopy. Other items on display are new photoelectric exposure meters for photomicrography and improved low-gear micro-manipulators that are made by Brinkmann Instruments, Inc., a manufacturing subsidiary of C. A. Brinkmann & Co.

#### **Carolina Biological Supply Company**

Booths 92 and 93. The Carolina Biological Supply Company cordially invites you and your friends to see the latest improvements and developments in biological materials and supplies. Special emphasis is being given this year to botanical preparations. Fred W. Emerson, author of *Basic Botany*, is now coordinator for all phases of botany; much has been done, under his capable supervision, to improve commercial offerings in this field. Our Plast-O-Mounts, biological specimens embedded in clear plastic, received international acclaim at the last convention of the American Medical Association. These will be displayed by a professional biologist who will be happy to assist you with any of your technical problems. Jumbo frogs from our Delta unit, Waubun Laboratories, will be shown along with other preserved and injected specimens.

#### **Central Scientific Company**

Booths 61 and 62. Cenco's exhibit features new apparatus and instruments for all types of laboratory research and testing. Among the items will be Cenco's new quiet operating Hyvac pumps; a new line of ovens and incubators; the Cenco Lab-Jack and Lab-Blocks for facilitating support of laboratory devices and glassware; the 5-quart Waring Blendor; Blendor accessory items; new Tube-On, safety device for inserting glass tubing in stoppers; new bottle stopper clamps; radioactivity demonstrator for study of tracer elements; concentrated arc lamps, and many other items. Cenco's representatives will be J. F. Green, Laird M. Boles, and Gordon C. Godejahn.

#### **Champion Paper and Fibre Company**

Booths 23 and 24. The exhibit of the Champion Paper and Fibre Company features an illuminated pictorial presentation of some of their forest conservation practices, manufacturing processes, and products. This company produces bleached and unbleached wood pulp from southern pines and hardwoods and manufactures a wide variety of business papers, fine coated papers, specialty papers and paperboards, and milk-carton and food-container paperboards. The general offices and parent mill of the Champion Paper and Fibre Company are at Hamilton, Ohio. Mills are also operated at Canton, N. C., and Pasa-

dena, Tex.; sales offices are maintained in New York, Philadelphia, Detroit, Chicago, Cincinnati, Atlanta, St. Louis, Dallas, and San Francisco; 9,300 employees are engaged in the annual production and sale of 565,000 tons of paper and paperboard. The company was founded in 1893.

#### **Chemstrand Corporation**

Booths 30 and 31. The Chemstrand Corporation, manufacturer of chemical textile fibers named Acrilan acrylic fiber and Chemstrand nylon, will have an exhibit that shows the flow from research and development through production at the two plant site locations at Decatur, Ala., and Pensacola, Fla. End products of wearing apparel and industrial products made from Acrilan acrylic fiber and Chemstrand nylon also will be on display. Literature will be available at the exhibit and representatives of Chemstrand also will be present to answer any questions.

#### **Coca-Cola Company**

Booths 17 and 18. Ice-cold Coca-Cola will be served through the courtesy and cooperation of the Atlanta Coca-Cola Bottling Company and the Coca-Cola Company.

#### **Denoyer-Geppert Company**

Booth 20. The Denoyer-Geppert Company will exhibit its line of visual teaching aids to the biological sciences and related subjects, featuring unbreakable plastic models and a wide variety of large colored wall charts. Skeletal preparations, museum mounts, corrosion specimens, and other nonprojective visual aids will also be shown. Plastic models by Denoyer-Geppert Company are the product of much research and long experience in model making. Denoyer-Geppert researchers have solved the problem of finding permanently durable substances that are also completely suitable for reproduction of the third-dimensional relief and detail that have characterized D-G models for so many years. The best elements of both design and construction have been combined in D-G models, and prices are nevertheless quite attractive. With models and other three-dimensional teaching devices displayed against a background of colorful charts, this exhibit will attract the eye and stimulate the interest of anyone engaged in instructional activities in the field of biology. Experienced representatives will be on hand to demonstrate D-G products, answer questions, and discuss visual teaching aids problems.

#### **E-C Apparatus Company**

Booths 41 and 42. EC510 countercurrent extraction apparatus will be exhibited for the first time at any national meeting. This apparatus separates and analyzes mixtures of compounds by repeated extractions in a two-phase liquid system. The 100-tube extraction train

with fully automatic recycle controls is only 24 inches long and 24 inches wide. Each tube is Pyrex with Teflon-lined screw cap for filling, cleaning, and emptying. A special attachment enables all samples to be withdrawn simultaneously into test-tube racks at the conclusion of the run. Countercurrent extraction has been used for separation and purification of mixtures in milligram to gram amounts. Components of molecular weight as high as insulin have been treated successfully. For higher molecular weight compounds, including proteins, polysaccharides, and nucleic acids, we exhibit for analytic and preparative purposes the following: EC135 electroconvection apparatus and EC405 electrophoresis apparatus. Electroconvection, by a combined electrophoretic and convective transport, fractionates colloid mixtures in volumes of 20 to 200 milliliters. Separations are achieved that cannot be obtained by any other fractionation method. The EC405 electrophoresis apparatus can be used for either starch or paper media. With direct pressure cooling of the migration bed, buffer evaporation is totally prevented and much higher field strengths are usable, enabling serum protein patterns to be obtained in less than 2 hours. Simultaneous runs at three different pH values can be made under identical conditions of temperature and voltage.

#### **Educational Testing Service**

Booth 19. The services of the Educational Testing Service include tests, testing programs, research, and services for selection, guidance, scholarship competitions, placement, and educational evaluation. ETS develops tests for direct sale to qualified users in schools, colleges, business, governmental agencies, and professional associations; administers nationwide testing programs; builds programs tailored to special needs; and conducts fundamental research in measurement.

#### **Embassy of Israel**

Taft Hall. The exhibition of the Embassy of Israel consists of about 3000 papers and other publications dealing with research in the field of agriculture, engineering, medicine, and the natural sciences. The papers cover a very wide field of scientific research ranging from an investigation into the possibility of using citrus peel for animal fodder to work on the separation of isotopes. The research work described in these papers has been carried on in Israel's leading scientific institutions, the Hebrew University in Jerusalem, the Israel Institute of Technology, the Weizmann Institute of Science, the Agricultural Experimental Station, and other research institutions. The exhibition, initiated and arranged by the Research Council of Israel, was first shown in London in December 1954 and was opened by

Robert Robertson, the famous Nobel prize winner. It has since been shown in Paris and Belgrade, and this is the exhibit's first showing in the United States.

**Emory University**

Booth 45.

**Encyclopaedia Britannica, Inc.**

Booth 78. The first Encyclopaedia Britannica was published in 1768. George Washington bought the third edition (printed in the United States) and liked it so well that he urged Alexander Hamilton to buy one, which he did—shortly before Burr killed him. Encyclopaedia Britannica has always been regarded as an educational institution rather than a business venture; therefore, it is fitting that today the University of Chicago owns Encyclopaedia Britannica. Encyclopaedia Britannica will exhibit the 1955 Encyclopaedia Britannica.

**Ercona Corporation**

Booth 36. The Ercona Corporation of New York, exclusive American representatives for the world-renowned Carl Zeiss Jena Optical Works, will place on exhibit the most recent developments in the microscope and optical measuring instrument departments. The exhibit will feature the unique Lumipan research microscope with pancratic illuminating system, permitting the employment of all phase-contrast objectives with only one annular stop; the new Citoplast stereomicroscope with built-in quintuple magnification changer, unusually long working distance, and parfocality of all five objectives; the laboratory interferometer for gas and liquid analysis with considerably higher measuring accuracy than the most exacting refractometers; the new model Abbé refractometer with scale fully protected in a dust-proof casing; and a number of other outstanding instruments. Inquiries are invited concerning the latest developments in Zeiss astronomical equipment.

**Folkways Records & Service Corporation**

Booth 25.

**A. French Textile School, Georgia Institute of Technology**

Booth 6. "Opportunities unlimited in textiles" will be the theme of the A. French Textile School of Georgia Institute of Technology. The central background feature of the exhibit will be a large photograph of the Harrison Hightower Textile Engineering Building at Georgia Tech, one of the most completely equipped buildings of its type in the country. On both sides of it will be draped a selection of fabrics, dyed in a wide range of colors and made from synthetic and natural fibers. Underneath the photograph is to be a display stand containing the major chemicals used in the textile industry. At the left side of the booth is to be an exhibit stand containing photographs and descriptions of

courses available in textile education. On the right side, another stand will feature photographs and listings of the many opportunities available in textile production, research, management, design, and sales. The booth will be completed with a table and chairs for visitors at the exhibition. This exhibit was made possible through the kindness of the Chicopee Mills, Inc.

**Gaumard Company, Inc.**

Booth 67. The Gaumard Company will exhibit flexible and plastic teaching models. The models shown have been designed by George Blaine, well known in England and Europe in this field of work as one of the pioneers of using plastic materials in model development. The models shown by Gaumard fall into two classes: biological teaching and clinical teaching. Some of the models are unique, not made by any other model house; thus, for instance, the miniature plastic skeleton with muscular markings (official teaching model in many European education departments—for example, department of education, London County Council, England); the transparent obstetric phantom, widely used in United Nations programs, (as are most other models shown). There are many publications in the world scientific press dealing with these models (*American Journal of Obstetrics and Gynecology*; *British Medical Journal*; *The Lancet*; *British Plastics*; *Rubber Age*; and others), which go a long way toward simplification of teaching by full use of a practical three-dimensional approach. The models reflect the approach of a practised teacher—aiming at the presentation of basic essentials. Physiological data are given with most models in order to round off the biological teaching program.

**General Electric Company, Research Laboratory**

Booths 1 and 2. The Research Laboratory of the General Electric Company will exhibit man-made diamonds; high-strength whisker crystals; 4-Mev x-ray tube (and other x-ray tubes); an ionic pump; a new light amplifier; and a new kind of electronic tube destined to play an important role in the future of electronics.

**Georgia Academy of Science and the Academy Conference**

Booths 79, 80 and 81. In view of the numerous sessions and functions at this year's AAAS meeting, the Georgia Academy of Science—which appreciates the honor of serving as host academy of the Academy Conference—will maintain a hospitality lounge in the Municipal Auditorium where chairs will be available for delegates and where they may arrange to meet their friends.

**Georgia State Department of Commerce**  
Booth 32.

**Graf-Apsco Company**

Booth 96. If you have any microscope troubles, it would be well to stop at booth No. 96 of the Graf-Apsco Company, "America's leading microscope repair house." Also exhibited are new Graf-Apsco microscopes with exclusive features designed into the stand to keep the instrument in good working order indefinitely. If you do not know what to do with your obsolete microscope, the Graf-Apsco Co. will buy it for cash or accept it in trade.

**Halco Scientific Instrument Company**

Booth 65. Halco Scientific Instrument Company will have on display Leitz, Zeiss, and Reichert microscopes and other optical instruments. The Graf-Apsco low-priced but sturdily built microscope especially designed for high-school laboratories will be available for examination. Sartorius balances and various instruments manufactured by Brinkmann Instruments, Inc., will also be exhibited.

**Linguaphone Institute**

Booth 55. Scientists the world over, without a knowledge of each other's language, are at a great disadvantage in effective communication. Yet, the need in this field is greater than it is in foreign trade, tourist travel, or even in cultural associations. Linguaphone has served scientists and the linguistic need of scientists consistently for the past 30 years. Linguaphone's exhibit will include language-learning recordings, textbooks, and related equipment.

**Lockheed Aircraft Corporation, Georgia Division**

Booth 13. The Lockheed Aircraft Corporation, Georgia Division, presents an exhibit of nuclear radiation shielding, a vital part of the process of putting the atom to work for modern industry. This display illustrates the effectiveness of a number of commonly recognized industrial materials as shielding for gamma radiation. A source of radiation, cobalt-60, a widely used radioisotope useful in many industrial processes, is mounted in a stationary position. A slowly revolving wheel causes several materials, such as steel, lead, plastic, water, and others, to pass between the source of radiation and a Geiger counter mounted in a box below the source. A specially adapted television receiver and amplifier indicate the relative amounts of radiation passing through the various shields. The varying intensities of radiation shown compare the usefulness of the materials in the shielding of the human being from the effects of gamma radiation.

**Lockheed Aircraft Corporation, Georgia Division**

Booth 91. Lockheed Aircraft Corporation's Georgia Division is cooperating with Georgia Institute of Technology in the improvement of their 9-foot wind



tunnel. This spirit of cooperation is the basic theme behind this exhibit. The display shows a scale model of this wind tunnel as it will appear after all remodeling is completed. The model is partially cut away in order to show, in greater detail, the more involved sections of the wind tunnel, such as the tunnel drive equipment, turning vanes, and test section. A model airplane is mounted in the test section just as it would be located under normal testing conditions. In addition to the model of the 9-foot wind tunnel, a small working wind tunnel will be demonstrated. This wind tunnel includes a visual means of illustrating the air flow behind an airplane model. The attitude of the airplane model with respect to air-stream may be varied and the effect observed.

#### **Lourdes Instrument Corporation**

Booth 87. The Lourdes Instrument Corporation has for 10 years manufactured the highest quality laboratory centrifuges and mixers. It is our pleasure at this 122nd meeting of the American Association for the Advancement of Science to present in the Exposition of Science and Industry four machines of the latest design, engineered for the most forward research problems and to meet the most limited budgetary requirements. Two of these units are high-speed angle centrifuges with 16,500 rev/min (max.), RCF—34,000×gravity (max.), and 400-cc volume. The third unit is a new design high-speed swinging cup centrifuge for improved and faster horizontal sedimentation with more accurate quantity determination. The fourth machine is the Lourdes multi-mixer featuring sealed mixing in 50- or 200-cc stainless steel containers—excellent for homogenizing, emulsifying, fine chopping and organism disintegration. All machines offer the finest in safety design.

#### **F. G. Ludwig, Inc.**

Booth 89.

#### **Josiah Macy, Jr. Foundation**

Booth 46. You are cordially invited to stop at booth No. 46 and peruse the "Transactions of the conference program," which are the nearly verbatim reports of multidiscipline 2-day conferences in the medical and biological sciences. These books offer an interesting insight into the broad problems of communication and integration between disciplines. We will have on display the new and stimulating volume on the patterns of animal and human behavior, the "Transactions of the first conference on group processes."

#### **G. & C. Merriam Company**

Booth 63. Our exhibit will display copies of the Merriam-Webster publications listed as follows: *Webster's New International Dictionary*, Second Edition—the unabridged work containing 600,-

000 entries including thousands of encyclopedic articles, many of them recording a wealth of information in the field of science. *Webster's New Collegiate Dictionary*—our largest abridged work, completely up to date (copyright 1953). *Webster's Dictionary of Synonyms*—listing synonyms, antonyms, and analogous and contrasted words, explaining the difference in their shades of meaning and illustrating their use. *Webster's Biographical Dictionary*—recording 40,000 biographies of noted men and women of all countries, with name pronunciations. *Webster's Geographical Dictionary*, Revised Edition—information on all the world's important places with name pronunciations. There will also be shown pamphlet material illustrating and explaining the use of these publications.

#### **National Geographic Society**

Booth 75. The exhibit of the National Geographic Society will feature the *National Geographic Magazine* and the *Geographic School Bulletins*. Also on display will be maps, books, pictures, and other special educational materials of the society. An automatic projector will screen a continuous selection of natural color slides. The slides cover National Geographic field assignments and expeditions and were selected from illustrations by staff photographers of the *National Geographic Magazine*.

#### **North American Aviation, Inc.**

Booths 53 and 54.

#### **Nuclear Instrument & Chemical Corp.**

Booth 52.

#### **Office of Naval Research**

Booth 90. Since its establishment in 1946, the Office of Naval Research has been engaged in supporting the very basic research that unearths new knowledge—the starting point for every major new material development. This concern with basic research has necessarily included development of the research tools needed to make new advances. The upper atmosphere is one area of research in which ONR has pioneered. Its strong upper atmosphere research program has led to the accumulation of important scientific data. This information has been obtained from research aircraft, from rockets, and from Skyhook balloons that carried scientific instruments to great heights to record meteorological and cosmic-ray data. To reach even higher altitudes a new system—Rockoon—was developed. Deacon rockets are borne to 70,000 feet, then fired into the stratosphere where they often reach heights of 300,000 feet to telemeter back upper atmosphere information. Recently another method was initiated—Rockair—firing of small rockets from planes. But more important than the tools used are the scientists who interpret the findings and use them as steps toward even more

advanced developments. Research in geophysics, metallurgy, chemistry, power, physics, electronics, mathematics, mechanics, and the biological and psychological sciences have led to developments in such fields as materials, aerodynamics, aeromedicine, design, propulsion, communications, flight, instrumentation and meteorology. These continuing advances permit exploration of the upper atmosphere at progressively higher altitudes.

#### **Phipps & Bird, Inc.**

Booth 37. Phipps and Bird will have an exhibit composed of a representative selection of instruments used in the basic sciences. Our representative will be pleased to demonstrate the equipment to you and to give you any technical assistance you might desire.

#### **Planned Parenthood Federation of America, Inc.**

Booth 77. In Rome, in 1954, the president of the World Population Congress said, "The great problem that today haunts the minds of men . . . is the extraordinarily rapid growth of population in underdeveloped countries." Where death rates fall through the application of preventive medicine, and birth rates remain high, population growth outruns the most vigorous efforts to raise living standards. Political leaders in many underdeveloped countries are urging the need for methods acceptable to their people. The Planned Parenthood Federation of America, through its research branch, the Dickinson Research Memorial, has taken up the challenge of these leaders. Since 1948 more than \$300,000 has been spent, all from voluntary contributions. Operating through grants-in-aid for the support of specific projects in established institutions, the memorial's research program is aimed at finding points where the human reproductive process is safely susceptible to interruption. This program contributes equally to possible treatment of infertility. The memorial calls occasional scientific conferences to chart developments in this double quest for fertility control.

#### **Potomac River Naval Command**

Booth B. The Board of Examiners for Scientific and Technical Personnel of the Potomac River Naval Command coordinates recruiting for all scientific and technical personnel for the 40 or more naval activities located in the area around and adjacent to Washington, D.C., the Potomac River, and Chesapeake Bay. The board will maintain an automatic sound slide projector depicting some of the scientific programs of the major naval laboratories of the command. Activities to be illustrated include the David Taylor Model Basin, Naval Air Test Center, Naval Gun Factory, Naval Observatory, Naval Ordnance Laboratory, Naval Photographic Center, Naval Powder Factory,

Naval Proving Ground, and the Naval Research Laboratory. Two of the laboratories are maintaining special exhibits at the exposition.

#### **Precision Scientific Company**

Booths 8 and 9. The Precision Scientific Company presents a daring innovation in industrial shows at this year's AAAS meeting in Atlanta. For the first time, it will have a display booth that allows exhibit visitors to view, in color, a manufacturer's entire line. More than 300 5-by-7-inch Ektachrome transparencies of laboratory research apparatus for such diverse fields as chemistry, medicine, petroleum, nucleonics, biochemistry, bacteriology and agriculture are contained in this specially designed booth.

#### **Rayoscope Company**

Booth A. The Rayoscope is a rather new and efficient microprojector and its many uses will be demonstrated. Special emphasis will be placed on projection of living specimens for long periods of time on a screen at a distance so that groups of observers can see simultaneously. Customers are urged to bring their own specimen slides which they would like to project to large classes. You will thus be given an opportunity to make your own test with regard to effectiveness of microprojection.

#### **Albert Schweitzer Honor Exhibit**

Booths 71 and 72 This exhibit, set up in honor of his 80th birthday, shows retrospective work of Schweitzer over a period of 42 years, built up by his own hands. This is the only hospital in the world where all patients and their relatives, in the middle of the jungle, are fed, housed, clothed, nursed, and medicated. The Albert Schweitzer bust on display is the work of Leo Cherne, president of the Research Institute of America; it captures the spirit of the greatest living doctor, the only M.D. who has received the Nobel peace prize. The bust was unveiled 12 Oct. 1955 at the Smithsonian Institution in Washington, D.C. The exhibit also shows a part of the new leper colony which is in the process of being built by Schweitzer this year. There is also a panel demonstrating the tolerance and nontolerance of the new antibiotics administered in the Hansen Syndrome.

#### **Science Library**

Booths 47, 48, and 49. The Science Library is administered by the AAAS as an additional service to publishers of books, both exhibitors and nonexhibitors. It has become an integral part of each year's Annual Exposition of Science and Industry. In the Science Library, books of all publishers participating are grouped by fields of science—a convenience both to the visitor who is restricting his inspection of books to a single category, and to the one who wishes to browse.

Among the publishers in the Science Library are American Association for the Advancement of Science, Academic Press, Inc., Addison-Wesley Publishing Company, Inc., Annual Reviews, Inc., R. R. Bowker Company, Cambridge University Press, Columbia University Press, Thomas Y. Crowell Company, Crown Publishers, Inc., E. P. Dutton & Co., Inc., Emerson Books, Inc., John de Graff, Inc., Harvard University Press, D. C. Heath and Company, Henry Holt and Company, Inc., Houghton Mifflin Company, Iowa State College Press, Johns Hopkins Press, Lantern Press, Inc., Lea & Febiger, Lothrop, Lee & Shepard Co., The Macmillan Company, Josiah Macy, Jr. Foundation, Merck & Co., Inc., Prentice-Hall, Inc., Reinhold Publishing Corporation, W. B. Saunders Company, Charles Scribner's Sons, University of Michigan Press, University of Toronto Press, University of Wisconsin Press, D. Van Nostrand Company, Inc., John Wiley & Sons, Inc., Yale University Press.

#### **Scripto, Incorporated**

Booth 3. Scripto, Inc. has available an interesting and educational motion picture sound and color film tracing the history of writing instruments from the dawn of history to the present time. Because of space and time limitations, it is not possible to show this film in its entirety, but selected scenes will be presented to illustrate the subject matter. Information concerning the availability of this film for the use of interested groups all over the country will also be presented. In addition, some of the more recent chapters of this history will be shown by displays that show how, as sci-

ence has developed new materials and techniques, they have been used in modern writing devices to simplify construction and improve quality and appearance.

#### **Southern Technical Institute**

Booth 35.

#### **Special Libraries Association, Georgia Chapter**

Booth 50. The Georgia Chapter of the Special Libraries Association will exhibit materials to show what a special library is, what it does, and how it can assist scientists.

#### **E. R. Squibb & Sons**

Booths 15 and 16.

#### **Trans-Pacific Import and Export Company**

Booth 56. Olympus microscopes are manufactured by the Olympus Optical Company of Japan, who are the pioneers of the microscope industry in that country. With about 40 years of experience and much valuable assistance given them by German precision instrument engineers and other available information, they are in a position to build the finest of microscopes. You are cordially invited to examine these excellent microscopes in exhibition booth No. 56. We will be in a position to show you most any type of microscope you may need, and also give you more microscope or microscopes for your money. Olympus microscopes cost about one third or more less than their equivalent in domestically made instruments.

#### **Veterans Administration Prosthetics and Sensory Aids Program**

Booths 82 and 83.

#### **W. M. Welch Manufacturing Company**

Booths 33 and 34. The W. M. Welch Manufacturing Company will exhibit laboratory instruments for physics, chemistry, and biology departments, including stainless steel balances, high vacuum pumps, electric measuring instruments, electronics teaching devices, Densichron for measuring optical density, color saturation, paper chromatograms, and so forth. Several additional pieces will be shown—mathematics teaching aids, microscopes, biological models, and preserved specimens. Several charts and sets of charts will be shown for teaching physics, physiology, and biology.

*But nothing has been done conducing directly to the encouragement of science in general. . . . The protection and favour of the Crown is still bestowed only upon those pursuits which are immediately connected with the defence or government of the country, or with the promotion of wealth or luxury, without reference to intellectual cultivation or the advancement of knowledge. Science, however, ever has been, and ever will be, of too elastic a nature not to make progress under every discouragement.—F. R. S., "Thoughts on the Degradation of Science in England" (1847). Quoted by George A. Foote, *Isis* 42, 206 (1951).*



## News of Science

### Properties of Viruses

The October 1955 issue of the *Proceedings of the National Academy of Sciences* (U.S.) contains two interesting articles on the properties of viruses. A paper by Fraenkel-Conrat and Robley Williams deals with the reconstitution of active tobacco mosaic virus from its inactive protein and nucleic acid components. The virus protein was separated from the ribonucleic acid either by dialysis at pH 10 or by treatment with the detergent dodecyl sulfate. Neither the protein nor the nucleic acid fraction was infectious for the tobacco plant, and neither fraction contained particles that resembled the virus in electron micrographs.

A solution containing 1 percent protein, 0.1 percent nucleic acid, and 3M buffer at pH 6 was kept in the cold for 24 hours. After this treatment, the mixture contained large numbers of particles that were indistinguishable from tobacco mosaic virus in the electron microscope and that were infectious for the tobacco plant. Brief treatment of the reconstituted virus with hot detergent permitted the demonstration in the electron microscope that the reconstituted virus particles contained a core of nucleic acid inside a cylinder of protein, just as in preparations of natural virus. Tobacco mosaic nucleic acid could not be replaced by other kinds of nucleic acid.

A paper by Stent and Jerne deals with the distribution of parental phosphorus atoms among bacteriophage progeny. When coliphage T4 is randomly labeled with phosphorus-32, there is a loss of infectivity as a result of radioactive decay. On the average, this "suicide" results from the disintegration of 10 atoms of phosphorus-32 per phage particle. When labeled phage particles are used to infect bacteria, some 40 to 50 percent of the label is transferred to the progeny.

Despite this efficient transfer, it was not possible to detect phosphorus-32 suicide among the progeny by loss of viability. This suggests that most of the parental phosphorus-32 is transferred to such a small minority of the progeny population that their suicide is not easily

measurable. However, the inactivation of a fraction of a labeled phage population may be detected by another more sensitive technique. The phosphorus-32 suicide of a phage particle results in loss of ability to transfer phosphorus-32 to progeny phage because, under conditions of single infection, it has no progeny.

A preparation of hot phage T4 containing 260 atoms of phosphorus-32 per particle was used for infection. The first generation progeny contained 43 percent of the parental phosphorus-32. The ability of this first generation progeny to transfer phosphorus-32 to second generation progeny was determined at intervals. The rate of decrease of phosphorus-32 transferability indicated that each of the suiciding particles contained between 2 and 6 percent of the phosphorus of its parent.

This suggests that the 50 percent of the phosphorus of each parent appearing in the progeny is distributed over at least 8 phage particles. One may conclude that parental phage nucleic acid is not transferred in one piece to a single progeny particle or randomly distributed over all progeny particles. Instead, it appears to be distributed in relatively large fragments to a small fraction of the progeny phage particles. These two papers have important implications with regard to the function of nucleic acids. —M.H.A.

### Soviet Medicine

Major and Mrs. Paul W. Schafer of Washington, D.C., a doctor-nurse team, recently completed a month-long visit to the U.S.S.R. as guests of the Soviet Ministry of Health. Their invitation was arranged by B. V. Petrovsky, surgical clinic chief of the Second Moscow Hospital. Petrovsky met Schafer, chief of the Thoracic and Cardiovascular Service at Walter Reed Army Hospital, during the 1954 World Congress of Cardiology in Washington. The Schafers, the first Americans to be afforded the opportunity of such a tour in more than a decade, traveled thousands of miles in the U.S.S.R., where they visited 40 hos-

pitals, clinics, research institutes, and sanatoria and talked with more than 200 Soviet physicians. Their itinerary included Leningrad, Moscow, and the North Shore of the Black Sea.

They found the Soviet medical and health system to be a highly centralized state organization that provides free care; doctors and nurses are paid by the state. Students get free medical education and then are assigned to work areas by the state. Some 20,000 physicians were graduated from the 75 Soviet medical schools last spring and 27,000 students matriculated this fall, 60 percent being women.

The Schafers do not feel that Soviet physicians are as adequately trained as Americans, and they also feel that physicians often are charged with responsibilities that could have been satisfactorily handled by nurses and technicians. The Soviets agreed that they had not placed sufficient emphasis on training programs for nurses and technicians and that they had thus been forced to produce larger numbers of doctors to implement their plan for medical care.

Generally, hospitals were found to be well run, clean, and efficient organizations in which patients appeared to be getting good medical care, although everywhere there was an apparent extravagance in the use of physicians. In Sochi each of the many sanatoria visited was found to have its own polyclinic with a staff of from 20 to 40 physicians caring solely for the medical needs of the institution's 200 to 300 patients, none of whom was acutely ill.

A similar situation was seen in general hospitals. For example, in 1954 the Bodkin Hospital in Moscow, which has 2400 beds, cared for 40,000 patients and performed 10,000 operations. There are approximately 500 doctors on the staff of this hospital—100 residents and 365 doctors in "postgraduate courses for rising qualifications." In addition, there is a teaching staff of 100.

Surgery is practiced extensively in the Soviet Union, despite the retarded development of anesthesiology. Using local anesthetic techniques, Soviet physicians perform essentially the same operations as are done in this country and appear to be having good results. All types of heart, lung, and esophageal operations are carried out under local anesthesia. Large volumes of ¼-percent procaine solution are administered after substantial premedication with pantopon or morphine.

Medical care closely follows the American pattern. Antibiotics are generally available but are used less frequently and in smaller dosages than in this country. Aside from an extensive BCG program, the medical management of tu-

bercuclosis, a major problem for the Soviets, is almost identical to ours. In contrast, tuberculosis surgery is not as adequate.

Infant and maternal mortality rates were found to have been sharply reduced during the past 5 years as the result of a nearly universal adoption of "natural childbirth" techniques. After a 1-month period of "psychoprophylactic orientation," 85 percent of Soviet mothers deliver without anesthesia.

Soviet psychiatrists reject Freud and do not use psychoanalysis. Instead they employ a "reflectory conditioning" program that consists primarily of a drugged sleep from which the patient is only gradually released. This procedure clearly reflects the work of Pavlov.

The Schafers were told of an impressive blood-transfusion program in which whole blood is preserved for as long as 100 days. In addition, they were shown bars made from dense red blood cell aggregates; these bars are used as intramedullary pegs in acute fractures of long bones and as onlay grafts for nonunions. The Schafers also saw an efficient burn dressing in the form of a pliable burn-dressing film made from bovine serum.

Particularly impressive were the infirmaries at Soviet industrial plants. One Moscow factory provides 75 beds for workers who have been incapacitated and who probably would not have been able to return to work in this country. By living in the factory's "preventorium," the patients are able to put in a half-day's work.

The Schafers report that everywhere they were received in a very friendly and hospitable fashion. Soviet physicians repeatedly emphasized their desire to establish contact with their American colleagues. In a conversation at the conclusion of the visit, Deputy Minister of Health Kochergin summarized this attitude when he said that Soviet officials would respond "instantaneously and favorably" to conversations with the United States relating to the exchange of medical delegations, postgraduate students, original scientific medical manuscripts, published medical periodicals, and personal medical correspondence.

### Marine Borer Chemists and Biologists

At this year's AAAS meeting in Atlanta, on Friday, 30 Dec., at 1:30 p.m., in Committee Room 1 of the Municipal Auditorium, there will be an organizational meeting of a proposed Society of Marine Borer Chemists and Biologists. All interested persons are invited to attend.

Since the inception of the AAAS, a great many scientific societies have been founded at annual meetings of the association. The Society of Systematic Zoology, organized at the annual meeting of the AAAS in Chicago, 1947, and the Society for the Advancement of General Systems Theory, organized at the Berkeley meeting, 1954—both of which are meeting with the AAAS this year—are but two instances—R.L.T.

### News Briefs

■ The Swedish deep-sea expedition on the *Albatross* in 1947-48 studied meteoritic enclosures in deep sea sediments. The small magnetic spheres generally considered to be of meteoritic origin that are found in such sediments have now been investigated in much greater detail than before by H. Pettersson, who has reported his findings in *Naturwissenschaften* [42, 387 (1955)].

Heretofore these spheres, which are about 0.2 millimeter in diameter, had been thought to exist only in the amount of about 1 milligram per kilogram of sediment. However, by use of a strong electromagnetic extractor, it has been found that the occurrence of these iron spheres in the sediment of the Pacific Ocean is about 20 to 40 times greater than was previously reported.

Furthermore, it has been thought that the spheres exist only in the uppermost 2 to 4 centimeters of sediment, but Pettersson has found them at depths of at least 3 meters, which corresponds to a sedimentation time of 1.5 to 3 million years. Therefore a considerable number of meteorites fell on the earth during the Tertiary period.

Plans are now being made to compare the frequency of distribution of these magnetic spheres in sediments that have been taken from various parts of the ocean. Such a study will provide statistics on the frequency of meteorite falls during the past millions of years and also will contribute to knowledge of the geochronology of the ocean floor.

■ The developing shortage of scientists and engineers is meeting with increasing attention from all groups of scientists and educators. In the *American Scientist* [43, 385 (July 1955)] another strong voice is added to the chorus of warning. Joseph W. Barker, president of the Research Corporation of New York, and the new president of Sigma Xi, points out that "while the situation now is critical, a continuation of this trend for another 10 years could prove disastrous to the future welfare and defense of our country."

The crux of the problem, as many

committees have realized, lies in the secondary schools. The salaries of high-school science teachers are so badly out of line with the salaries commanded by college graduates who have majored in the sciences, mathematics, or engineering and who go into industrial positions that virtually all of last June's graduates in these fields were preempted by industry.

Despite this, there was a shortage of 4000 even to replace the losses in industry resulting from death or retirement. Obviously, with the present demand, government and college positions cannot be filled, to say nothing of the need for teachers that will arise as the effect of the increased wartime birth rate makes itself felt at the college level. The crest of the growing population is just now entering the high schools, and the demand for science teachers, among others, will be most serious just when the supply is practically zero.

Sigma Xi is inaugurating a prize competition (first prize, \$1000; second prize, \$500; third prize, \$100) to be awarded to those chapters, branches, or clubs whose plan for alleviating this situation is judged most promising. Some valuable suggestions may result.

Meanwhile, let us point out that since public education in the United States is a local responsibility, no effective remedy can be expected except on the local scene. School boards, town and city officials, and ultimately the individual taxpayer, must be alerted to the crisis and apprised of its national significance. Scientists must take time to assume this local responsibility of educating their own communities.—B.G.

■ A diagnostic test for rheumatoid arthritis is now available to the country's physicians through the Grace-New Haven Hospital in New Haven, Conn. This was announced on 9 Nov. by Ronald W. Lamont-Havers, associate medical director of the Arthritis and Rheumatism Foundation at 23 W. 45 St., New York.

Rheumatoid arthritis can be treated in 70 percent of the cases effectively enough to prevent pain and crippling if it is detected early. One diagnostic problem has been that the condition is difficult to differentiate from more benign forms of arthritis. Also, the disease is difficult to detect at all in the very early stages when therapy is most effective.

The new test is an outgrowth of an observation first made in 1947 at Columbia-Presbyterian Hospital, New York. At that time it was noted that the serum of blood from victims of rheumatoid arthritis causes solutions of sensitized sheep blood cells to clump together in a distinctive way. The reason for this effect of the rheumatoid arthritis serum is still

unknown. Nevertheless, the test is a sensitive and accurate diagnostic means. It is now known that a blood factor present in persons with rheumatoid arthritis causes the clumping of sheep cells. This factor is inhibited by a second factor that prevents clumping. The second factor predominates in normal individuals.

A few years ago the sheep-cell test was only 50 percent accurate. Research at the Columbia University College of Physicians and Surgeons, the New York University College of Medicine, the Yale University School of Medicine, and the Grace-New Haven Community Hospital has since increased the accuracy of the test to more than 90 percent. The test also is valuable because it is positive in a high percentage of early cases.

Instructions on how to submit blood samples to the New Haven laboratory for analysis may be obtained by physicians by writing to the Streptococcus Laboratory of the Grace-New Haven Hospital, 789 Howard Ave., New Haven, Conn.

■ The Scientists' Committee on Loyalty and Security, 2153 Yale Station, New Haven, Conn., has become the Scientists' Committee on Security, Inc., at the same address. The members of the committee hope that this change to formal incorporation will allow them to work more effectively and to make better use of the volunteer manpower of the group.

The new committee will try to keep in touch with responsible opinion, to answer inquiries and perform a general clearing house function, to collect information on security matters, and to promote a better popular understanding of the problems of science and security. The committee solicits comments and suggestions from scientists, particularly with regard to security problems.

■ Banding is proving that the monarch butterfly is a true migrant, and first migrant to be confirmed in the insect world. Under Fred Urquhart, director of zoology at the Royal Ontario Museum, Toronto, Canada, a research team of 250 observers in Canada and the United States has put gummed labels on the wings of 33,000 monarchs. The group plans to finish the 4-year study with the banding of 40,000 more specimens in 1956.

Already the project has proved that millions of monarchs born in Ontario and the northeastern states fly south for the winter and instinctively return in the spring to their birthplaces to die. The longest recorded flight was from Hanlan's Point, Ontario, to Virginia Beach, Va.—a straight-line distance of 1000 miles.

Banding is being carried on by a volunteer corps of university professors,

government employees, and amateur naturalists. An extremely high birth rate and an equally high casualty rate reduce the chance of a banded butterfly's being recovered to about one in a thousand.

The monarch's migration pattern follows that of a number of birds. In summer many specimens go to southern Ontario and the northeast states, where milkweed—upon which the female lays her 400 eggs—is abundant. The female always dies within a few days after depositing eggs. The young monarchs begin to flock and start southward from Ontario in the last 2 weeks in August.

### Scientists in the News

JOHN OLIVER LA GORCE was honored on 7 Nov. at a dinner in Chevy Chase, Md., in recognition of his 50 years with the National Geographic Society, and of the part that he has played in making its name a household word. The society's board of trustees presented him with the Grosvenor medal, which was created in 1949 by Gilbert Grosvenor, former president and editor and now chairman of the society's trustees.

Leading figures and geographic and scientific organizations in all parts of the world, from the Royal Geographical Society in London and the Association of Japanese Geographers in Tokyo to the Geographic Society of Finland in Helsinki, sent their good wishes to La Gorce in honor of his golden anniversary.

J. ROBERT OPPENHEIMER, physicist and director of the Institute for Advanced Study at Princeton, N.J., will give the William James lectures in philosophy and psychology at Harvard University in the spring of 1957. The lecture series, delivered every second year under the auspices of the departments of philosophy and psychology, was established by Edgar Pierce in memory of William James, who taught both subjects at Harvard.

ERNST H. BARANY of the University of Uppsala, Sweden, will present a lecture on 8 Dec. at the National Institutes of Health, Bethesda, Md. As guest of the ophthalmology branch of the National Institute of Neurological Diseases and Blindness, Barany will speak on "Factors controlling the resistance to flow through the chamber angle." All interested persons are invited to attend the lecture.

RONALD C. VICKERY, specialist in rare earths who was formerly a member of the Commonwealth Scientific Industrial Research Organisation in Australia, has become associated with the chemistry and metallurgy research staff of Horizons Incorporated, research organization in Cleveland, Ohio.

R. N. DOETSCH, associate professor of bacteriology at the University of Maryland, has been appointed a 1956 fellow of the John Simon Guggenheim Memorial Foundation at the Rowett Research Institute, Bucksburn, Aberdeenshire, Scotland. He will work with A. E. Oxford on some aspects of rumen microbiology.

PAUL W. KABLER, HAROLD F. CLARK, EDWIN E. GELDREICH, and HAROLD L. JETER, all of the Robert A. Taft Sanitary Engineering Center of the U.S. Public Health Service at Cincinnati, Ohio, have been selected for the 1955 Kimble Methodology Research award for outstanding contribution to the field of public health. They are being honored for their development of the use of a membrane filter technique for the bacteriological analysis of water samples. Through their method it is possible to incubate, count, and identify the bacteria from a sample of water in as little as 16 hours; conventional analysis methods require from 48 to 96 hours.

LAUCHLIN M. CURRIE has been appointed a vice president of Union Carbide Nuclear Company, a division of the Union Carbide and Carbon Corporation. Currie has been vice president of National Carbon Company, another division of Union Carbide.

SHIRLEIGH SILVERMAN of the Applied Physics Laboratory, Johns Hopkins University, has taken a year's leave, effective 1 Nov., to serve as director of the Physical Sciences Division, Office of Naval Research.

H. H. SMITH will be on leave from the department of plant breeding, Cornell University, until 1 Oct. 1956. During his leave, to be spent at the Brookhaven National Laboratory, special lectures and consultations with students will be offered by a series of visiting professors. These include: for the month of December 1955, M. WESTERGAARD, professor and head of the department of genetics, Copenhagen University; for the spring semester of 1956, A. H. SPARROW, Brookhaven National Laboratory, who will give a course in radiobiology; for June 1956, M. M. RHOADES, professor of botany, University of Illinois; for July 1956, S. G. STEPHENS, head of the genetics faculty, North Carolina State College; for August 1956, R. D. OWEN, professor of biology, California Institute of Technology.

JOHN J. GAVIN, former head of the biological control unit of Smith, Kline and French Laboratories, Philadelphia, Pa., has been appointed chief microbiologist for the Food Research Laboratories, Inc., Long Island City, N.Y.

G. M. ADAMSON, JR., has been appointed head of the homogeneous reactor program of the metallurgy division, Oak Ridge National Laboratory. He succeeds J. L. GREGG, who has returned to Cornell University after a year's leave. J. H. DEVAN has replaced Adamson as head of the dynamic corrosion section.

Other changes in the metallurgy division include the resignation of W. O. HARMS, who has accepted a teaching post at the University of Tennessee. M. L. PICKLESIMER succeeds Harms.

E. C. ELTING has been appointed deputy administrator for Experiment Stations in the U.S. Department of Agriculture's Agricultural Research Service, a post left vacant by the retirement of the late R. W. Trullinger. Elting joined the Department of Agriculture in 1936 as a specialist in dairy husbandry on the staff of the Office of Experiment Stations.

The following appointments to assistant professor have been announced. University of Alabama: GRAY C. BUCK and ORVILLE CLAYTON, surgery; ROBERT EARL ROTH and HAROLD SCHNEIDER, pathology. University of Pittsburgh: PHILLIP BACON, geography; JOHN CAMERON, physics; JOHN ULRICH, speech; IAN MITCHELL SUSSEX, biological sciences. University of Mississippi: JAMES L. KLINE, physics; MALCOLM ROBERTSON, psychology.

## Necrology

WAYNE ARNOLD, Ridgefield, Conn.; 35; physicist for Schlumberger Wells Survey Corp.; former member of the staff of the Los Alamos Scientific Laboratory; 15 Nov.

ALFRED T. BEALS, Hackensack, N.J.; 85; photomicrographer; expert on mosses and lichens; 8 Nov.

ALBERT E. BOTHE, Merchantville, N.J.; 64; professor of urology, Graduate School of Medicine, University of Pennsylvania; 11 Nov.

ALVA CLARK, Washington, D.C.; 65; director of research and development in a sector of the U.S. Department of Defense; retired vice president of Bell Telephone Laboratories; 14 Nov.

SAMUEL J. CROWE, Baltimore, Md.; 72; emeritus professor of laryngology at Johns Hopkins University; 13 Nov.

ARTHUR H. CURTIS, Evanston, Ill.; 74; former head of the department of obstetrics and gynecology of the Northwestern University Medical School; 13 Nov.

BERNARD DE VOTO, Cambridge, Mass.; 58; Pulitzer prize-winning historian who was an emphatic proponent of conserva-

tion of the nation's natural resources; 13 Nov.

JONAS FRIEDENWALD, Baltimore, Md.; 58; associate professor of ophthalmology at Johns Hopkins University, Baltimore; 5 Nov.

PAUL F. GAHR, Auburn, N.Y.; 75; professor emeritus of physics at Wells College; 12 Nov.

WARDLAW MCGILL HAMMOND, Philadelphia, Pa.; 75; photomicrographer; honorary research associate at the Farlow Herbarium of Cryptogamic Botany; Harvard University; 9 Nov.

ELY C. HUTCHINSON, Washington, D.C.; 73; management consulting engineer; World War II consultant on scientific and technical affairs in the Office of Research and Development, the War Production Board, and the Office of Technical Services; 12 Nov.

JOHN J. HYLAND, New York, N.Y.; 51; electronics expert; founder and chairman of the board of Control Instrument Company of Brooklyn; 11 Nov.

JAMES M. SWAINE, Ottawa, Canada; 77; former Dominion entomologist; 11 Nov.

## Education

■ Vernon Lippard, dean of the Yale University School of Medicine, recommended recently that medical schools should be "in physical proximity" to the rest of the university and not far distant from the central university campus. In his address as retiring president of the Association of American Medical Colleges, Lippard urged a closer integration between medical schools and the universities with which they are associated.

He contended that a medical school is often more concerned with its hospital than with its university obligations. Blaming both the medical schools and the universities for this situation, he said that "the day has passed when medical education and research can be carried on efficiently in isolation."

Lippard also pointed out that a college education generally has been accepted as a prerequisite for admission to medical school but that the methods of medical instruction have too many of the characteristics of undergraduate education.

"Our curricula are crowded from early morning until late at night with required exercises, the compulsion of frequent and detailed examinations in course is considered necessary, little time or incentive is provided for the pursuit of special interests, and participation in the advancement of knowledge is relegated to the postdoctoral level." He stressed that such practices are "not compatible with graduate study in a university where introduction of the student to severe and

self-reliant intellectual effort is the major purpose."

Pointing out that current practices of medical education were conceived before the internship and residency were accepted, he said "the medical student continues to expend what I believe to be an inordinate proportion of his efforts in pursuit of the urine specimen and the hemocytometer, with no decrease in time devoted to these chores as participation in new diagnostic procedures is imposed upon him."

■ The Albert Einstein College of Medicine of Yeshiva University was formally dedicated last month before an audience of 5000 people. Congratulatory messages, including one from President Eisenhower, came from all over the country.

Symbolic of the dedication was an inscribed plaque that was presented by the college's first class of 53 men and 3 women to Hans Albert Einstein, Albert Einstein's son. The plaque included the pledge that the students would "carry on in the spirit of warm humanity and scientific integrity exemplified by Albert Einstein, justifying his high hopes for the college as a valuable instrument for advancing medical science and the national welfare."

Although the school has just opened, it starts more or less full fledged, with adequate teaching and laboratory facilities and the hospitals, and other auxiliaries that usually are acquired slowly through the years.

The college is the heart of a new medical center that is to cost \$100 million. It will be open to all who are academically qualified, without regard for race, creed, or nationality.

■ Lehigh University has received a private grant sufficient to support the full expenses of the bioelectric laboratory of the department of psychology for the next 10 years. The primary research program of the laboratory is the study of muscle action potentials in muscular fatigue, with Arnold M. Small, Jr., and Nathan B. Gross as principal investigators.

■ A lecture series designed to acquaint high-school science teachers with recent developments in science has been undertaken by Washington University in cooperation with the St. Louis Public Schools Advisory Committee. It is hoped that the monthly series, entitled the "Frontiers of science," will add to the teachers' ability to stimulate an interest in science among high-school students.

The lectures are open to all teachers in public, private, and parochial schools in the St. Louis area. The St. Louis Public School System is permitting



teachers to take time from their regular duties to attend the lectures. Two meetings have already taken place, each being attended by about 200 teachers, or nearly two-thirds of the science teachers in the area.

The program was arranged by a Washington University faculty committee consisting of Barry Commoner (chairman), Viktor Hamburger, Herbert A. Potratz, Robert D. Sard, H. LeRoy Scharon, and Sidney F. Velick. It is hoped that the series will become a regular annual activity.

### Grants, Fellowships, and Awards

■ In its recent report covering the years 1953 and 1954, the Alfred P. Sloan Foundation, Inc., listed some 80 educational, medical, and other institutions as recipients of its grants. These grants totaled more than \$6.5 million. When added to the commitments made since the foundation began an active program early in 1937, these additional grants bring the total foundation commitments as of 31 Dec. 1954, to somewhat in excess of \$27 million.

Despite the fact that a relatively large number of institutions received support from the foundation during the biennium under review, far the larger share of the dollar value of the commitments went to a relatively few recipients. Such action was dictated by the foundation's desire to continue its long-time policy of concentrating support in a few large projects. Thus almost two-thirds of the funds committed during the biennium, or somewhat more than \$4 million, went to nine recipients.

More than \$2 million went for cancer research, the funds being given to the Sloan-Kettering Institute for Cancer Research and to institutions affiliated with the Sloan-Kettering program, including the Memorial Center for Cancer and Allied Diseases in New York and the Southern Research Institute of Birmingham, Ala. Approximately \$1.25 million was donated to various foundation-supported enterprises at Massachusetts Institute of Technology. There the foundation's chief current interest continues to be the School of Industrial Management, which was organized with foundation assistance in 1952. Special research projects, a project for foreign scientific and engineering students, and various scholarship and fellowship programs account for the remaining funds committed to M.I.T.

Other large projects that accounted for sizable portions of the foundation's gifts were the Council for Financial Aid to Education, Inc., \$155,000; Teleprograms, Inc., \$400,000; New York University, \$253,000; Institute for Atmospheric Physics at the University of Ari-

zona, \$150,000; the Brookings Institution, \$163,000; the National Bureau of Economic Research, Inc., \$118,000; and Tuskegee Institute, \$100,000.

During the two-year period reported, the foundation developed three new areas of activity in which it intends to commit funds in the future. The first of these involves a national scholarship program for undergraduates in selected American colleges of liberal arts and technological institutions.

The second new area involves a program that seeks to advance knowledge of the cause, treatment, and cure of glaucoma and related diseases of the eye. Under this program, grants are currently being made to medical schools and other institutions conducting research projects in this general area. Currently, annual expenditures approximate \$150,000. For the administration of this project, a special organization, known as the Council for Research in Glaucoma and Allied Diseases, has been set up with headquarters at 111 E. 59 St., New York 22. The chairman of this council is Conrad Berens, professor of ophthalmology, New York University-Bellevue Medical Center.

The third of the three new areas added to the foundation's scope of operations during the biennium relates to the foundation's new program to stimulate basic research in physical science. This program originated in a special gift of \$5 million made to the foundation in 1954 by Mr. and Mrs. Alfred P. Sloan, Jr.

This gift, and such additions as may be made to it in the future, will be administered as a special fund of the foundation. Grants will draw on both the fund's principal and income. In time such grants are expected to approximate \$500,000 per annum.

This new activity will fall under the direction of the foundation's recently appointed administrator for this program, Richard T. Arnold. He will be assisted by an advisory group of five scientists. The chairman of this group is Arthur C. Cope, professor and head of the department of chemistry, Massachusetts Institute of Technology.

Grants under this program, which is limited initially to chemistry, physics, and mathematics, will seek to support scientists—particularly young scientists in universities—who are engaging in qualified research projects. It is unlikely that the fund will support large research programs.

In a preface to the report, Alfred P. Sloan, Jr., president of the foundation, reiterated the foundation's adherence to the policy of using its funds to assist in the discovery of new knowledge and for the promotion of research and investigation.

The report pays tribute to the late Karl T. Compton, former head of the Massachusetts Institute of Technology, who joined the board of trustees of the Sloan foundation at an early date and who served until his death in 1954.

■ Eleven National Science Foundation grants-in-aid will be made for research work at the Highlands Biological Station, Highlands, N.C., for the summers of 1956 through 1958. Applications for awards will be reviewed by the Board of Managers of the station. Research proposals must be concerned with the fauna or flora of the Southern Appalachians; they may involve any of the various fields of biology. Applications must be submitted in triplicate *not later than 1 Mar. of each year.*

The following grants will be available: (i) four postdoctoral grants of \$500 each, open to advanced research investigators; (ii) three predoctoral grants of \$400 each, open to advanced graduate students capable of engaging in independent investigations; and (iii) four graduate-student grants, open to graduate students with little experience in independent research and who must carry out their research proposal under the direct supervision of a principal investigator.

Application blanks will be available about the end of November. Further information may be obtained from the executive director of the Highlands Biological Station, Prof. Thelma Howell, Department of Biology, Wesleyan College, Macon, Ga.

■ The Ciba Foundation has announced its 1955-56 award program for experimental research in problems of aging. Papers descriptive of work in the field should be submitted *before 10 Feb. 1956* to G. E. W. Wolstenholme, Ciba Foundation, 41 Portland Place, London, W.1, who also will provide details of the conditions of the contest.

Five awards, of an average value of £300 each, are available. Entries will be judged by an international panel of scientists that will include C. H. Best (Toronto), E. Braun-Menendez (Buenos Aires), E. J. Conway (Dublin), G. W. Corner (New York), A. Haddow (London), V. R. Khanolkar (Bombay), R. Nicolaysen (Oslo), A. S. Parkes (London), and F. G. Young (Cambridge). In making recommendations, this group will also have power to suggest variation in the size and number of the awards according to the standard of entries. Preference will be given to younger workers. The article, which may not exceed 7000 words, should not have been published before 31 July 1955, although it may have been under consideration for publication on that date.

## In the Laboratories

■ The Atomic Energy Commission is soliciting proposals for the production of refined uranium salts in privately owned and operated facilities. The process steps employed in the atomic energy program to convert the uranium content of ores to the desired form consist of mining and milling of ores to produce a concentrate, refining the concentrate to produce a purified salt, conversion of the salt to metal or uranium hexafluoride, and in the case of metal, fabrication into suitable shapes. At present the extent of participation by private industry in these activities is limited to the mining and milling steps.

Specifically, the commission is interested in receiving proposals from qualified firms to process, over a 5-year period, uranium ores or concentrates to either uranium tetrafluoride, or uranium hexafluoride, with deliveries to begin about July 1958. The commission will consider proposals for any production rate up to a maximum of 5000 tons  $U_3O_8$  equivalent per year. Proposals may be based on arrangements whereby the  $U_3O_8$  concentrates are supplied by the commission and refined salts returned, or alternatively the commission will consider proposals for direct purchase of the refined salts from a company having or obtaining its own supply of uranium ores or concentrates.

To assist in the preparation of proposals, the commission will make available classified technology relating to refining of uranium salts to those applicants eligible to receive classified data under the access permit procedure. Information relative to obtaining access permits as well as further details relative to the preparation of proposals can be secured by writing to Mr. Harold L. Price, Director, Division of Civilian Application, U.S. Atomic Energy Commission, Washington, D.C. Proposals will be accepted through 31 Mar. 1956.

■ North American Aviation has announced establishment of the Autonetics Division for continuation of its engineering and manufacturing operations in the electromechanical field. Developed from engineering studies inaugurated nearly 10 years ago in relation to the company's program of guided missile development, North American's work in electromechanics has grown into an operation now employing nearly 8000 persons.

The new division is engaged in the development and production of automatic navigational systems, autopilots, automatic flight control systems, airborne armament control systems, radar systems, analog and digital computers, data-processing equipment, and automatic controls for machine tools.

John B. Moore, who has been head of the company's electromechanical engineering department, has been named general manager of the Autonetics Division. The newly formed unit will occupy expanded facilities now under construction near North American's Downey plant.

■ The Consolidated Vacuum Corporation, a subsidiary of Consolidated Engineering Corporation, Pasadena, Calif., has been merged with the parent organization and will be known as the ConVac Division of Consolidated.

■ Stockholders of Consolidated Engineering Corporation, Pasadena, Calif., have voted a change in company name to Consolidated Electrodynamics Corporation. The new name became official on 9 Nov.

## Miscellaneous

■ The complete collection of technical papers from the Government Synthetic (Copolymer) Rubber Program has been made available to the public for the first time. The rubber research program was begun under the War Production Board in World War II and then was continued under other agencies after the war. Recently it became a responsibility of the National Science Foundation, which has made the reports available.

The 3750 reports, covering the period 1 Feb. 1943 through 30 June 1954, are reproduced on microfilm or photocopy and may be obtained from the Photoduplication Service, Publication Board Project, Library of Congress, Washington 25, D.C. The papers are identified as PB 118310. Microfilm cards giving the title and a brief summary of each of the reports are also available. Prices will be quoted on request.

Also available is a four-volume compilation of abstracts from the program. It is PB 111736, *Abstracts of Technical Papers from the Government Synthetic Rubber Program*, which may be ordered from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C.; price, \$5 a set.

These abstracts of papers published between 1942 and 1953 were prepared by the Research and Development Division, Office of Synthetic Rubber, Reconstruction Finance Corporation. They include a summary of the research done by the many industrial, institutional, and governmental groups participating in the program.

■ The new Hall of Physical Geology, which has been in preparation at the Chicago Natural History Museum for several years, was opened to the public just over a month ago. In the new hall are presented basic facts about this

planet—its origin, its structure and composition, what its interior is like, the nature of its surface, its age, how and why its face is constantly changing, and the forces that act on it from within and without. This information is visually transmitted in a series of 37 large exhibits.

Grouped in the center of the hall are four dioramas. In three of these, the light automatically changes to simulate variations in appearance outdoors that occur with the changing time of day. One of these dioramas illustrates the effect of stream erosion with a model of a scene in the Grand Canyon.

Another diorama shows what a glacier is like, how it acts, and what it does to topography. The third diorama illustrates the processes by which volcanoes come into being, as well as their activity and its effects. The fourth diorama, representing the interior of a cave, demonstrates the solvent action of ground waters.

Many of the exhibits in the hall are devoted to a comprehensive exposition of the subject of rocks. The visual treatment of rocks shows the differences between igneous, sedimentary, and metamorphic.

The new hall was prepared under the supervision of Sharat K. Roy, chief curator of geology. Staff members who aided in the work include Harry E. Changnon, curator of geology exhibits, Henry Horback and Henry U. Taylor, preparators, and Maidi Wiebe, artist.

■ Some of the work being done at the atomic energy center at Oak Ridge, Tenn., is described in a new 44-page booklet, "The atom in our hands," that has just been published by Union Carbide and Carbon Corporation. Copies may be obtained by writing to Union Carbide and Carbon Corporation, Room 308, 30 E. 42 St., New York 17.

■ Among the articles in the December issue of *The Scientific Monthly* are "Effects of nuclear weapons testing," Gordon M. Dunning; "Ecological experimentation with animal populations," Thomas Park; "Herodotus on the subject matter of economics," Joseph J. Spengler; "Beauty and the beast: life and the rule of order," Paul Weiss; and "Homeostasis, society, and evolution: a critique," Jules Henry.

In the "Association Affairs" section there is a preview of the 122nd meeting of the AAAS that is to be held in Atlanta, Ga., 26-31 December. Also included in this section are a report on amendments to the AAAS constitution and condensed statements of AAAS finances for the year 1954.

Twenty-two books are reviewed in this issue.

## Reports and Letters

### Production of Pharyngoconjunctival Fever in Human Volunteers Inoculated with APC Viruses

In a previous communication (1) it was stated that intranasal inoculation of human volunteers with adenoidal-pharyngeal-conjunctival (APC) viruses (2-5) had failed to produce objectively recognizable illness. Similar results were reported for APC 4 (RI-67) virus by Hilleman *et al.* (6). However, successful transmission experiments in volunteers (7) with bacteria-free nasopharyngeal secretions from a case of ARD were shown by Ginsberg *et al.* (8) in retrospect to be associated with specific antibody responses to the RI-67 strain. Subsequently, as reported in this article (9), combined conjunctival and pharyngeal inoculation of type 3 and type 4 APC viruses produced easily recognizable definitive disease in susceptible human volunteers.

Twenty volunteers received type 3 virus (study G2); seven received a mixture of approximately equal parts of (i) a virus-containing throat washing from a patient with fever and sore throat and (ii) fluid from the sixth monkey kidney tissue culture passage of another strain of type 3 virus that was recovered from a case of pharyngoconjunctival fever (5); 13 received fluid from a pool of 40 virus-containing specimens taken during the same outbreak. In another study (H2) type 4 virus was used, the inoculum consisting of fluid from the third monkey kidney tissue culture passage, following isolation in human embryo trachea tissue culture of strain R.N. (4) that was recovered from a recruit at the Great Lakes Naval Training Center. The control inoculum in both studies was the maintenance medium used for monkey kidney tissue cultures; all inocula contained penicillin (250 units/ml) and streptomycin (250 µg/ml). All virus-containing inocula were cultured in thioglycolate broth and inoculated into suckling and adult mice, intraperitoneally and intracerebrally, and rabbits, intracutaneously into multiple sites and on the scarified cornea; the cultures were negative and the animals showed no evidence of illness.

A cotton applicator soaked in the test

inoculum was gently swabbed on the lower tarsal conjunctiva of one eye and on the posterior pharynx; the other eye of the volunteer was similarly swabbed with the control inoculum. The observers did not know which eye had received the virus. The volunteers were examined at daily intervals for the first week and on alternate days during the second week. Bloods were collected prior to inoculation, 3 weeks after inoculation (study G2), and 4 weeks after inoculation (study H2). Specimens from each eye and the throat were collected by means of swabs on the fifth day after inoculation. Half of the volunteers in each study were white and half were Negro; their ages varied from 21 to 25 years.

Laboratory studies on the volunteers were carried out by personnel who had no knowledge of their clinical responses. Neutralization tests were done with the procedure designated as "procedure 2" (4); virus isolation attempts from swab specimens were made in HeLa cell tissue cultures, a specimen being considered positive if typical APC cytopathogenic effects occurred during the 12 days of observation.

The most pronounced and objectively obvious effect of the virus inoculum was an acute catarrhal conjunctivitis; for the purposes of this report, a volunteer was considered to have developed illness if conjunctivitis was noted on 2 successive days by the examining physicians and if the volunteer offered specific complaints referable to the eye. Twenty-six of the 40 volunteers developed such illnesses. The incubation peri-

ods ranged from 2 to 7 days; 21 of the 26 ill persons had onset on or before the fourth day after inoculation.

The complaints in the 26 ill individuals were conjunctival symptoms (itching, burning, tearing, and foreign body sensation) in 26, sore throat in 20, cough in 15, headache in 13, and nasal symptoms in 12. Generalized aching and stiff neck, hoarseness, chest pain, chilliness, and malaise were noted in a few cases.

The catarrhal conjunctivitis, which in many cases later became follicular, began in the area of inoculation, and progressed rapidly to involve the palpebral and bulbar surfaces. Edema of the eyelids was a frequent finding, and a few cases showed some hemorrhage into the conjunctiva. Slit lamp examination during the acute stage of illness and several weeks after recovery revealed no corneal or uveal tract involvement. Other physical signs in the 26 cases included inflamed pharyngeal lymphoid patches in 24, inflamed nasal mucosa in 20, nasal discharge in 17, and preauricular lymph node enlargement in 16. Fever of 100°F or more occurred in eight persons. Several cases showed distinct enlargement of the tonsil on the same side as the virus-inoculated eye. The usual duration of illness was 7 to 8 days, and in some cases signs and symptoms continued for more than 10 days.

Conjunctivitis was seen in the eye inoculated with control material in only two individuals, and in these the eye became irritated on the seventh and eighth days after the virus-inoculated eye had shown definite conjunctivitis. One volunteer, inoculated with type 3 virus, on the 17th day after inoculation developed a temperature of 104.8°F and physical and x-ray signs of pneumonitis in the lower left lobe; he had had severe conjunctivitis during the first week after inoculation. Virus was not recovered during the period of pneumonitis.

The clinical manifestations, which closely resembled those of pharyngoconjunctival fever (5), produced by the two different virus types appeared indistinguishable, as were the illnesses produced by the two type 3 inocula. Racial differ-

Table 1. Occurrence of illness in relationship to preexisting antibody level, neutralizing antibody response, and recovery of virus. Figures given show number of ill per number of volunteers.

Type of APC virus given	Preinoculation antibody titer			Neutralizing antibody response (fourfold or more)*		Recovery of virus from eye or throat swabs	
	< 4†	4-8	> 8	Rise	No rise	Positive	Negative
3	12/12	2/3	1/5	14/15	1/4	14/16	1/4
4	8/8	2/8	1/4	11/14	0/5	11/14	0/6

\* One person in each study not available for convalescent serum. † Reciprocal of dilution.

ences did not appear to influence the clinical response.

Table 1 gives the relationship of the occurrence of illness to the laboratory findings. Although the numbers are small, the differences in each category appear to be significant. These data show that the frequency of illness was inversely related to the level of preexisting neutralizing antibody to the virus type inoculated and directly related to the development of a neutralizing antibody response and to recovery of virus from the inoculated sites. In summary, conjunctival and pharyngeal inoculation of type 3 and type 4 APC viruses in volunteers having little or no preexisting neutralizing antibody produced illnesses indistinguishable from pharyngoconjunctival fever.

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9. We are indebted to the inmates at the Maryland State Reformatory for Males, to the authorities of the Department of Correction, State of Maryland, and particularly to Robert L. Clopper, assistant superintendent of the Maryland State Reformatory for Males, without whose assistance these studies would not have been conducted. The work at Johns Hopkins University was supported in part by a grant from the Research Grants Division, National Microbiological Institute, and by the Common Cold Foundation.

10 August 1955

#### Possible Role of Chelation between Alkali Metals and Pyridoxal in Biological Transport

The cellular transfer processes for the amino acids and the alkali metals are closely connected. Heavy loading of either process appears to inhibit the other. On the one hand, the concentrative transfer of amino acids falls off rapidly when the potassium ion level is raised (1). Conversely, a large transfer of amino acid into the cells causes potassium loss and sodium gain (1, 2).

Furthermore, pyridoxal and related

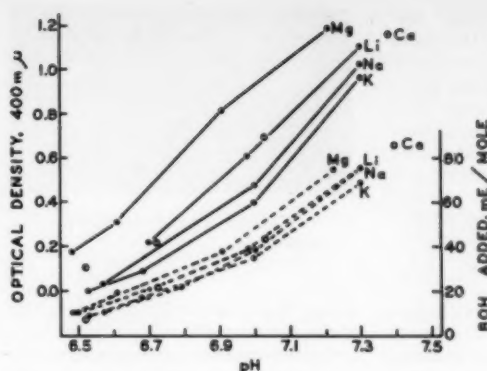


Fig. 1. Absorption and titration changes due to alkali and alkaline-earth cations. The solid lines show the optical density at 400 mμ and refer to the scale at the left; the dashed lines are titration curves, referring to the scale at the right.

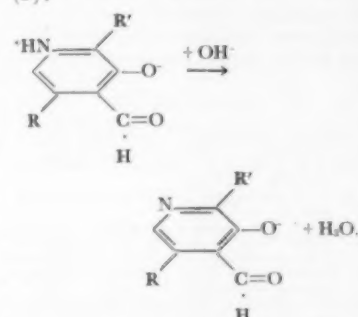
aromatic *o*-hydroxyaldehydes not only stimulate amino acid accumulations by ascites tumor cells but also cause profound shifts of the alkali metal ions. At low pyridoxal levels, potassium loss is more conspicuous and the cells shrink; at higher levels, sodium entrance predominates and the cells swell (3).

Whereas pyridoxal is known to form metabolically active derivatives with the amino acids, evidence for its combination with the alkali metals apparently has not been previously reported. In the present study, spectrophotometric and titrimetric evidence for differential chelation of the alkali metals with pyridoxal in water solution has been obtained (4).

Fresh 0.01M pyridoxal solutions were prepared that included a metal chloride and small quantities of a metal hydroxide (added as a 0.02N solution) to give pH values increasing in steps from 6.5 to 7.5. In the experiments of Fig. 1, the following combinations were used: (i) no chloride and KOH; (ii) 0.15M KCl and KOH; (iii) 0.15M NaCl and NaOH; (iv) 0.15M LiCl and LiOH; (v) 0.05 M CaCl<sub>2</sub> and Ca(OH)<sub>2</sub>; and (vi) 0.05M MgCl<sub>2</sub> and KOH. Preparations of NaCl and LiCl from two different sources were tested. After 1 hour at 25° to 27°C, the optical densities at 400 mμ were determined, using silica cells and the Beckman spectrophotometer. The pH of the remaining portion of each solution was then determined at once with the Beckman laboratory model pH meter.

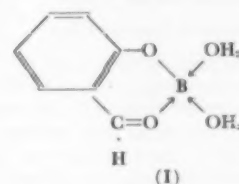
With magnesium the extra yellow coloration was very obvious to the eye. The optical densities decreased in the order Mg, Ca, Li, Na, and K (Fig. 1). The amounts of alkali required to produce a given pH were in the same order. The effect of Ca<sup>++</sup> at 0.05M was only moderately larger than that of Na<sup>+</sup> at 0.15M; accordingly the reaction with Na<sup>+</sup> should predominate at typical extracellular levels of the two ions. The extra density produced by the various cations increased gradually for 1 hour, and then gradually decreased.

The reaction with the hydroxyl ion alone may be represented as follows (5):

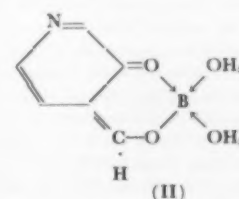


A pKa of 8.70 has been obtained for this reaction, titrating, however, in 0.15N NaCl (6). The yellow color has been attributed to a quinoid tautomer (7). Our results indicate that a second reaction involving the cation occurs to produce proton displacement and new absorption.

Alkali metal chelates of *o*-salicylaldehyde and its derivatives were obtained in nonaqueous systems by Sidgwick and Brewer (8) and Brady and Bodger (9). Structure (I) was proposed.



With pyridoxal, the quinoid form (II) should be considered.





Pyridoxal contains groupings that make plausible chelation of the alkali metals, either in aqueous or lipid phases. Furthermore, the reaction probably produces a neutral molecule that might carry the metal ion through cellular boundaries. Concentration gradients of the metal ion might be established if the molecule undergoes a secondary modification (for example, phosphorylation or displacement of the metal ion by an amino compound) on one side of the phase boundary.

Significantly, the metals that chelate more strongly with pyridoxal ( $Mg^{++}$ ,  $Li^+$ , and  $Na^+$ ) are the ones that tend to cause the apotryptophanase-pyridoxal phosphate system to dissociate, whereas  $K^+$  and  $Rb^+$  tend to stabilize the holoenzyme (10).

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### Electrophoresis of Serum Proteins in a Viscous Film

In the study of proteins by the technique of filter paper electrophoresis, convection or diffusion and adsorption of proteins to the paper with resultant trailing are among the limiting factors in the resolution that can be obtained (1). With a protein solution containing 98 percent albumin and 2 percent  $\gamma$ -globulin, the densitometer curves obtained from filter paper electrophoresis in our laboratory indicate that 10 to 15 percent of the albumin is lost in trailing. The work of Brakke (2) with graded density columns of sucrose, and of Philpot (3) who conducted electrophoresis employing a multilayered solution, suggested the possibility of electrophoresis in a viscous film. We felt that the viscosity and

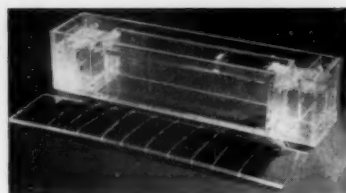


Fig. 1. Plexiglas apparatus set up for film electrophoresis.

surface forces might be related to the ability of such a film to serve as an anti-convection medium and that the use of a fluid rather than a solid electrophoresis medium would tend to decrease trailing.

An electrophoresis apparatus was constructed of Plexiglas for this purpose; it is shown in Fig. 1. It consists of a longitudinal platform between two electrode vessels containing platinum electrodes and labyrinthine dividers. The experiments were conducted by placing a glass plate  $1\frac{1}{8}$  by 10 inches on the shelf and a film on the glass plate. After investigating several substances, we used the following method to provide a viscous film of suitable properties. Agar-agar, 0.13 g, was added to 100 ml of barbiturate buffer of pH 8.6 and ionic strength 0.05. This was then heated and boiled for 1 minute, until the agar-agar dissolved. Methyl cellulose, 0.028 g, was then added to the solution and thoroughly mixed. The resultant solution is near the gel point, containing slightly less than the amount of agar-agar necessary for gel formation. While the solution was still warm, it was added with a pipette to the glass plate to form a film about  $1/16$  inch thick.

The film was then connected to the buffer in the electrode vessels by means of filter paper wicks, covered, and voltage applied for 10 minutes, after which more of the solution used to make the film was added if the thickness of the film had decreased. (The surface of the film should be smooth, and it should exhibit interference colors from reflected light. If the concentration of agar-agar is increased above the amount used, there is a decrease in the protein mobility and in the resolution, and the dried film tends to crack and peel off. If a smaller concentration is used, the resolution again appears to decrease.) The serum was then added by means of placing a small piece of filter paper, about 10 mm by 4 mm, which had been soaked in the serum, on the film. The cover of the apparatus, lined with wet blotting paper, was sealed with Saran wrap in order to prevent evaporation. If this precaution is observed, the film is still liquid at the end of the run, and it will run down the glass plate if the glass plate is significantly tilted. It was found that a suitable separa-

tion could be obtained by the application of 100 v for a period of 16 hours. The current obtained at 100 volts with this setup is about 3 ma.

When the electrophoresis has proceeded a sufficient length of time, the protein pattern can be obtained by two different procedures. A slightly damp strip of filter paper can be carefully placed over the film and the glass plate inserted into a drying oven at  $120^{\circ}C$ . As soon as the film is dry, the filter paper can be removed and developed in the usual manner (4). An alternative procedure is to dry the film as such, without any filter paper, insert the glass plate in an alcoholic solution of bromphenol blue, wash the film briefly with 1-percent acetic acid, and redry the film by placing the glass plate in the oven again. The glass plate can then be inserted directly into a densitometer, and the optical density curve can be obtained. The protein pattern can be accentuated by placing a blank strip of filter paper between the plate and another glass plate that is blank.

The mobility on the film is approximately the same as it is on filter paper. Albumin stained with bromphenol blue was found to migrate at about 0.65 cm/hr at 100 v. (This includes a velocity component in the opposite direction owing to electroosmosis.) The distance of migration is linear with time.

Figure 2 shows the results obtained

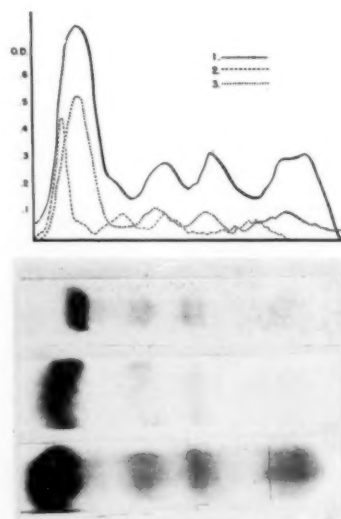


Fig. 2. Electrophoresis strips and corresponding densitometer patterns of the same sample of serum made by three different procedures: curve 3 and top strip show serum run on a film and developed on glass, curve 2 and middle strip show serum run on a film and picked up on paper, curve 1 and bottom strip show serum run on paper by conventional procedure.

with the same sample of serum by three different procedures: (i) curve 3 and top strip show electrophoresis run on a film and developed on the glass; (ii) curve 2 and middle strip show electrophoresis run on a film and developed by picking up the protein pattern on filter paper; (iii) curve 1 and bottom strip show the usual method of filter paper electrophoresis done by the method of Köiwi (4) and employing 130 v for a period of 15 hours.

Definite conclusions concerning the relative amount of trailing in the top and bottom strips cannot be drawn from Fig. 2, because the amount of serum applied differs in the two instances. The use of the film does appear, however, to provide favorable resolution with relatively little trailing, compared with reports of results obtained with filter paper (1, 4). The preparation of the film and setting up of the experiment require approximately 1 hour. It seems probable that the results obtained with films can be improved over those reported here and that the electro-osmosis can be eliminated by the use of suitable film thickeners (2). Further experiments are being conducted along these lines.

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14 July 1955

### Oxalate Content of Tropical Forage Grasses

It is generally known that the average milk production of the dairy cow in the tropics is far below that of the dairy cow in the temperate zones. Average annual production per cow in India is about 400 pounds (1) and in Puerto Rico it is about 2000 pounds (2). In the United States, the average annual production per cow is well over 5000 pounds, with sectional averages of more than 8000 pounds (3).

The various agencies of Puerto Rico that are concerned with the improvement of dairy herds have shown that, under proper management, the production of dairy herds in Puerto Rico can equal that of similar herds in the United States (4). These agencies are very optimistic about the prospects for increasing greatly the milk production of herds in Puerto Rico.

One of the many complex factors involved in proper management is the care-

Table 1. Oxalate content of tropical forage grasses harvested at 6 to 10 weeks of age

Scientific name	Common names	Oxalic acid (% dry weight)
<i>Andropogon carricosus</i>	Cuban grass	0.25
<i>Axonopus compressus</i>	Carpet grass	0.02
<i>Bouteloua heterostega</i>	Lamilla	0.02
<i>Chloris inflata</i>	Mexican bluegrass	0.43
<i>Cynodon dactylon</i>	Coastal Bermuda	0.16
<i>Cynodon dactylon</i> common	Common Bermuda	0.02
<i>Cynodon plectostachyum</i>	Star grass	0.09
<i>Digitaria decumbens</i>	Pangola	0.89
<i>Eriochloa polystachya</i>	Malojilla	0.22
<i>Melinis minutiflora</i>	Molasses grass	0.41
<i>Panicum maximum</i> var. <i>borinquen</i>	Borinquen	1.10
<i>Panicum maximum</i> var. <i>common</i>	Guinea grass	2.01
<i>Panicum maximum</i> var. <i>gramalote</i>	Guinea grass	1.05
<i>Panicum maximum</i> var. <i>broad-leaf</i>	Broad-leaf guinea grass	2.26
<i>Panicum maximum</i> var. <i>fine-leaf</i>	Fine-leaf guinea grass	1.65
<i>Panicum purpuracens</i>	Pará grass	1.24
<i>Paspalum fasciculatum</i>	Venezuela grass	0.02
<i>Paspalum plicatulum</i>	Sweet grass	0.02
<i>Pennisetum ciliare</i>	Buffel grass	0.83
<i>Pennisetum purpureum</i> var. <i>merkerii</i>	Merker grass	2.48
<i>Pennisetum purpureum</i>	Elephant grass	2.57
<i>Sporobolus indicus</i>	Cerrillo	0.22
<i>Sporobolus virginicus</i>	Beach grass	0.12
<i>Stenotaphrum secundatum</i>	San Augustine	1.20

ful consideration of the quality and chemical composition of the forage grasses that are fed to the herd. During the last few years, improvement in the quality of feedstuffs has been credited with more than 50 per cent of the increase in milk production in New Zealand (5). In all countries where highly productive dairy herds have been developed, a comprehensive knowledge of the chemical composition of the forage crops has aided materially in increasing milk production.

During one phase of a current study of tropical forage crops, the oxalate content of 24 frequently encountered forage and cut grasses was determined. All grasses were grown under similar field conditions in 10- by 25-foot plots and harvested at 6 to 10 weeks of age. In order to reduce the errors resulting from variation within each species, the sampling techniques developed and recommended by Vickery and Meiss (6) were used, with slight modifications. Each grass sample was a composite of 50 plants, including stems and leaves but no seeds. These samples were chopped, dried at 80°C in a forced-draft oven for 24 hours, and ground to pass an 80-mesh sieve. The oxalate concentrations were then determined by the permanganate method as modified and described in detail by Moir (7). The results of these analyses are shown in Table 1.

This brief chemical study brought out the fact that the most commonly used and highly recommended (8) grasses were those containing the highest concentra-

tions of oxalates. Five widely used grasses contained more than 1.6 percent oxalic acid (Table 1). Extended and elaborate feeding trials by other investigators have shown that roughage containing 1.6 percent oxalic acid will lead to a negative calcium balance when it is fed *ad libitum* to nonlactating cows (9).

Whether or not the oxalate-rich grasses are a contributing cause to the low productivity of milk in the tropics is at present unknown. The percentage of the required digestive nutrients that can be obtained safely from oxalate-rich grasses has not been determined.

A detailed study of the chemical composition of one of the oxalate-rich grasses (Merker grass) is being made in conjunction with a feeding trial. This comprehensive knowledge of the chemical composition, together with the digestibility data, should indicate whether or not this oxalate-rich grass is defective in nutritive value or detrimental to the health of dairy cows (10).

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- 11 July 1955

## Diffusion Constant and Diffusion Coefficient

J. Verduin has pointed out that the Krogh diffusion constant has been erroneously regarded as an index of diffusivity of gases in liquid media (1). The confusion has arisen from failure by some biologists (i) to examine the units used by Krogh (2) and (ii) to compare them with those of the true diffusion coefficient. For his concentration gradient, Krogh has used the difference in partial pressure of gas per unit length of liquid phase, thereby introducing solubility into his diffusion constant; this distinguishes it from the diffusion coefficient.

I join Verduin in criticizing those biologists who have made gross errors in their use of the Krogh diffusion constant. However, a number of points in Verduin's paper may be misleading and are therefore discussed here.

1) It is worth noting that the value of  $D$ , the diffusion coefficient, for  $O_2$  in water at 16°C (1.607 cm<sup>2</sup>/day) quoted by Spoehr (3) was not directly determined but was derived by Carlson (4) from his own experimental determination of 1.720 cm<sup>2</sup>/day at 18.2°C. Carlson assumed a 3-percent change in  $D$  per de-

gree change in temperature to derive a value for 16°C.

Verduin has misquoted the value calculated by Carlson and quoted by Spoehr. He quotes it as 1.607 cm<sup>2</sup>/day at 20°C. As a consequence, Verduin's calculation of a Krogh diffusion constant at 20°C of 0.346 has no foundation.

2) The effect of temperature on the diffusivity of oxygen bears closer examination than that given by Verduin.

Table 1 summarizes, first, quoted values of  $D$  for  $O_2$  in water (or dilute aqueous solutions) and second, values used for the increase in  $D$  with temperature for various substances in water.

Table 2 gives values for the increase in the diffusion coefficient of oxygen in water per degree rise in temperature. A linear increase per degree has been assumed and only the experimentally determined values of  $D$  from Table 1 have been used.

It appears from Table 2 that it is reasonable to suggest that the diffusion coefficient for oxygen in water increases linearly about 3 percent per degree rise in temperature within the range of 16° to 25°C.

The figure used by Verduin, 1.6 percent per degree Celsius (15), is a characteristic of the diffusion current measured in polarographic determinations and is dependent on a number of other variables in addition to the diffusion coefficient of the substance being examined.

3) Krogh asserts that his diffusion constant increased about 1 percent per degree rise in temperature. Verduin maintains that this statement is false and that there is no change in the Krogh constant within the temperature range of 20° to 30°C.

Table 2. Change in  $D$  with temperature calculated from values in Table 1

Temperature interval (°C)	Linear increase in $D$ (%/°C rise in $T$ )
16 to 18.2	2.8
16 to 22	3.1
16 to 25	3.0
16 to 25	4.3*
18.2 to 22	3.0
18.2 to 25	2.9
18.2 to 25	4.5*
22 to 25	2.4
22 to 25	5.7*

\* The results based on Kolthoff and Miller's value  $D = 2.6 \times 10^{-5}$  cm<sup>2</sup>/sec at 25°C are of doubtful significance. Kolthoff and Lingane (14) in their latest book have used the earlier experimental value of  $2.38 \times 10^{-5}$  cm<sup>2</sup>/sec at 25°C.

The decrease in the solubility of oxygen between 16° and 25°C is about 1.6 percent per degree. The relationship shown between the experimental determinations of four observers at four temperatures indicates an increase in  $D$  of about 3 percent per degree rise in temperature for oxygen within the same temperature range in water. Thus,

$$K_{T+1} = K_T \times \frac{103}{100} \times \frac{100}{101.6}$$

That is,

$$K_{T+1} = K_T \times 1.014,$$

where  $K_T$  is the Krogh diffusion constant at temperature  $T$ .

Thus the increase in the Krogh diffusion constant is about 1 percent per degree rise in temperature within the range given.

4) Verduin has produced evidence of the misuse of the Krogh diffusion constant. Some physiologists have treated diffusion problems without confusion and it may be worth while recording some of them here for future reference. Hill (11) used both Krogh diffusion constants and true diffusivities, illustrating the interrelations of the two and their changes with temperature. Hill devoted some time to discussing the diffusivity of  $CO_2$  in tissues (based on Krogh's value) which is still 1.2 times the diffusivity of  $O_2$  when solubility differences are corrected. It is felt that the work of Hill has not received the attention it deserves; it has evidently escaped the notice of Prosser *et al* (16) and perhaps other physiologists. More recent biological studies of  $O_2$  and  $CO_2$  diffusion through tissues that clearly appreciate the nature of the diffusion coefficient include Briggs and Robertson (17), Roughton (18) and James (19).

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Table 1. Values of  $D$  and its change with temperature for  $O_2$  in aqueous media

Temperature (°C)	Substance	Original measure of $D$	$D$ (10 <sup>-5</sup> cm <sup>2</sup> /sec)	Approx. linear increase in $D$ (%/°C rise in $T$ )	Authority
16	$O_2$	1.62 cm <sup>2</sup> /day	1.875		Hüfner (5)
18	$O_2$		1.98	3*	Carlson (6)
18.2	$O_2$	1.720 cm <sup>2</sup> /day	1.99	3*	Carlson (4)
22	$O_2$	$2.22 \times 10^{-5}$ cm <sup>2</sup> /sec	2.22†	3*	Brdička and Wiesner (7)
25	$O_2$	$2.38 \times 10^{-5}$ cm <sup>2</sup> /sec	2.38	‡	Kolthoff and Laitinen (8)
25	$O_2$	$2.6 \times 10^{-5}$ cm <sup>2</sup> /sec	2.6		Kolthoff and Miller (9)
28 to 37	$O_2$			3*	Davies and Brink (10)
20	$O_2$			2.5*	Hill (11)
20 to 30	unspecified			2.5*	Höber (12)
20 to 25	unspecified			2.9*	Bull (13)
unspecified	unspecified			3*	Einstein diffusion equation (Höber, 12)

\* Values stated by authors but not experimentally determined. † Determined by dropping mercury electrode—mean value of six readings where drop time was 2 to 4 sec (see Kolthoff and Lingane, 14). ‡ Diffusion current changed 4 percent per degree (14).

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13 June 1955

## Correction

The ultrasonic dosages given in W. J. Fry et al., "Ultrasonic lesions in the mammalian central nervous system" [*Science* **122**, 517 (1955)] should be corrected as follows: For the lesion illustrated in Fig. 1, the dosage was 40 atm acoustic pressure amplitude and  $3.9(10^2)$  cm/sec acoustic particle velocity amplitude. For the lesions illustrated in Figs. 2 and 3, the dosage was 41 atm acoustic pressure amplitude and  $4.0(10^2)$  cm/sec acoustic particle velocity amplitude.

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7 November 1955

## Thomas Bradwardine His Tractatus de Proportionibus

I am sure both the author and the University of Wisconsin Press personnel welcomed the excellent review by Carl Boyer of H. Lamar Crosby, Jr.'s, recent volume on Thomas Bradwardine [*Science*, **122**, 562 (23 Sept. 1955)]. However, I believe one amendment to the review is in order. Boyer very graciously mentioned the work in medieval science being done at the University of Wisconsin, but in doing so he left the distinct impression that Crosby's volume was written here at Wisconsin in our depart-

ment. As much as we would like to claim some part in the direction of the work that went into the writing of this volume, we must note that it was completed by Crosby under the stimulating guidance of Ernest Moody while the latter was at Columbia University. My only part in the volume was to recommend its consideration for publication by the University of Wisconsin Press and to add a foreword.

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24 October 1955

## Separation of Complete and Incomplete Rh Antibodies by Centrifugation

The division of Rh antibodies into complete (saline agglutinins, bivalent) and incomplete (blocking, univalent) varieties is based on differences in their immunologic reactions. Physicochemical, electrophoretic, and biologic differences in these antibodies have been reviewed in recent publications from these laboratories, and additional data concerning their immunologic and electrophoretic nature have been presented (1-3). Although there are no experimental data dealing directly with the possibility of differences in molecular shape and size of Rh antibodies (4), Wiener has speculated that such differences probably exist (5). Previously, Deutsch et al. (6) and Pedersen (7), on the basis of ultracentrifuge studies of human serum, reported that  $\beta$ -isoagglutinins occurred to some extent in a "heavy" molecular weight fraction of serum globulin. In view of this work, an investigation was undertaken to determine whether Rh agglutinins could be separated from Rh incomplete antibodies by centrifugation. The present report presents the preliminary result of this investigation (8).

Serums were merely diluted with 1 vol of 1.0-percent sodium chloride solution, clarified by centrifugation at 4000 rev/min and then centrifuged for 7 hours at 40,000 rev/min in a Spinco No. 40 rotor

with refrigeration. The first preparations consisted of four fractions representing four volumetric divisions of the 10-ml sample in each centrifuge tube. Fraction 1 consisted of the upper 3-ml portion, fraction 2 the next 3 ml, fraction 3 the next 3 ml and fraction 4 the remaining solution of about 1 ml plus the gelatinous pellet on the bottom.

The results of a typical fractionation in this preliminary series are shown in Table 1. The serum used in this run was prepared by mixing an incomplete anti-DE serum with a saline agglutinating anti-E serum in the ratio of 2.5 ml to 18.0 ml. The anti-DE serum was obtained from an O-Cde/cde individual who had been immunized to the Rh factor 13 years previously by a blood transfusion. Since then, there were repeated exposures to Rh antigen from pregnancies and more recently, following hysterectomy, from small injections of Rh positive blood as a volunteer donor. The serum had a titer in albumin of 1/4000 anti-D and 1/64 anti-E; there was no activity in saline. The anti-E saline agglutinating serum was obtained from an A-CDe/CDe individual immunized by cDe cells from blood transfusions and pregnancies. This serum's agglutinin titer was 1/512 in saline and 1/64 for incomplete antibodies, as estimated by the antiglobulin augmentation titer (3). The mixture of the two serums and the fractions produced by centrifugation resulted in titers shown in Table 1. Titrations were performed with O-CDe/cde, O-cDe/cde and B-cde/cde cells.

These preliminary results indicated that under the prescribed conditions of centrifugation, the saline agglutinating antibodies were sedimented more completely than were the incomplete antibodies. The saline agglutination reaction with the F-4 fraction was unusual in that the button of agglutinated cells could not be broken apart by the most vigorous shaking.

By repeated recycling of the F-4 fraction, and particularly the gelatinous pellet that separated out at the bottom of the centrifuge tube, it has been possible to separate the agglutinin from the incomplete antibody even more effectively.

Table 1. Antibody titers (expressed as dilutions of the original sample of serum) of serum fractions obtained by centrifugation.

Material	Protein concentration (%)	Agglutinins				
		Incomplete		Complete		
		anti-D	anti-E	anti-D	anti-E	anti-B
Serum	—	1/256	1/256	0	1/512	1/32
F-1	0.85	1/16	1/8	0	0	0
F-2	2.25	1/256	1/128	0	1/16	0
F-3	3.25	1/256	1/256	0	1/128	1/1
F-4	8.92	1/2000	±	0	1/4000	1/256



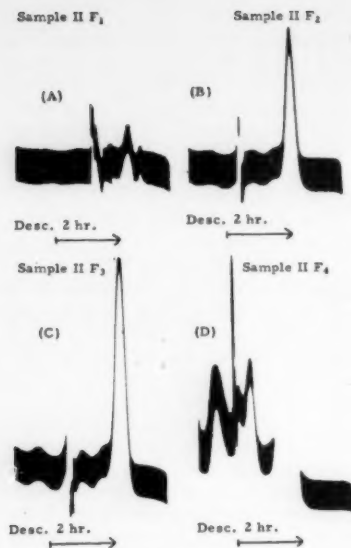


Fig. 1. Electrophoretic patterns of descending boundaries of human serum fractions obtained by centrifugation.

One serum from an O-cde/cde individual that failed to show any saline agglutinin antibodies was treated as described here. The pellet that formed after 7 hours at 40,000 rev/min, upon resolution and testing with O-CDe/cde cells, gave a saline agglutinin titer of 1/64. The pellet was redissolved in a volume of saline equal to the volume of the original diluted serum from which it was obtained, and the solution was centrifuged again. The sedimented material gave a saline agglutinin titer of 1/128 with stronger reactions in all dilutions.

Investigations of the physical properties of the various fractions have not been completed, but preliminary data showed the following properties. The F-1 fractions were colorless and had a slight opalescence. The remaining successive fractions had a yellow color that increased in intensity until it became dark yellowish-orange in F-4. The material that centrifuged out as a gelatinous pellet on the bottom was essentially colorless.

Electrophoretic patterns of the four fractions listed in Table 1 are shown in Fig. 1. The protein concentrations of the F-1, F-2, F-3, and F-4 fractions were 0.43, 1.13, 1.63 and 4.46 percent, respectively. The solution was in barbital buffer, pH 8.6 and  $\mu = 0.1$ . The F-1 fraction was obviously different from the original serum, but the remaining three fractions indicated no particular abnormalities except for the high protein concentration.

Sedimentation analysis was made of the F-4 fraction only. The pattern of a 4.5-percent protein solution in 1.0-percent sodium chloride is given in Fig. 2. This pattern was obtained at 40 minutes and 250,000 g. A heavy component comprising about 5 percent of the total protein with a sedimentation constant of about 17 S (uncorrected) separated at this time. The slower sedimenting material later separated into two components to give about 75 percent 4.5 S and 20 percent 7 S.

After the F-4 fraction was redissolved in 10 ml of 1.0-percent sodium chloride and was recentrifuged for 2 hours, and this step was repeated twice again, the principal electrophoretic components were alpha-2 globulin and albumin. The sedimentation pattern shown in Fig. 3 was taken at 24 minutes and 59,780 rev/min. The solution contained 0.7 percent protein. The  $S_{20,w}$  for the fast component was 19.4 S. The slow component resolved later into equal amounts of two

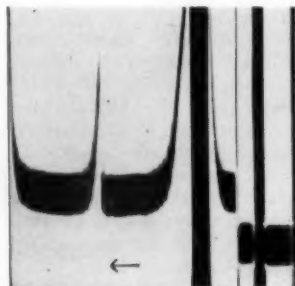


Fig. 2. A sedimentation velocity pattern of fraction 4 obtained by centrifugation of human serum.

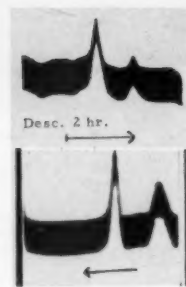


Fig. 3. (Top) Electrophoretic pattern of an F-4 fraction after three recyclings; (bottom) sedimentation pattern of same material.

components having  $S_{20,w}$  values of 6.8 S and 4.2 S, respectively.

These preliminary experiments clearly indicated that Rh saline agglutinins sedimented at a faster rate than the incomplete type of antibodies. They also suggest that practical separation of agglutinating and nonagglutinating types of antibodies can be accomplished by centrifugation.

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8. This work was supported by the National Institutes of Health. Contribution No. 2011. We wish to acknowledge the technical assistance of Alexander Kahn of Gates and Crellin Laboratories of Chemistry.

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14 July 1955

Charles G. Darwin, my predecessor in my Edinburgh Chair (of Natural Philosophy), once said something like this: "The ordinary man can see a thing an inch in front of his nose; a few can see things 2 inches distant; if anyone can see it at 3 inches, he is a man of genius."—MAX BORN, *Experiment and Theory in Physics* (Cambridge, 1943), p. 34.

## Book Reviews

**An Outline of Atomic Physics.** Oswald H. Blackwood, Thomas H. Osgood, and Arthur E. Ruark. Wiley, New York; Chapman and Hall, London, ed. 3, 1955. x + 501 pp. Illus. \$7.50.

In this third edition, Blackwood, Osgood, and Ruark present a revision of their well-known standard textbook that was first published in 1933. Once widely used and liked by students as well as teachers, the earlier editions of the book became obsolete because of the fast progress of nuclear physics, and the book was gradually replaced by more modern texts. The book was replaced with great reluctance and regret, for it provided a very satisfactory course intermediate between mathematical treatments intended for specialists and texts using mainly word pictures and analogies. The new edition again achieves this good balance and at the same time has been brought completely up to date. I am convinced that teachers are looking forward to making use again of this excellent *Outline of Atomic Physics*.

The structure of atoms and molecules and the nature of radiation are discussed in the first half of the book. This part, though extensively rearranged and improved in many places, is essentially the same as it was in the earlier editions. The clarity of the presentation has been enhanced considerably. The second part, which deals mainly with nuclear physics and related problems, has been rewritten almost entirely. New chapters on applications of nuclear physics and on cosmic rays, including a discussion of pi and mu mesons and other unstable particles, have been added, and a chapter on elementary particles has replaced the chapter "Neutrons, positrons, and nuclei" of the former edition.

On the whole, the book is well organized, the arrangement of the topics is excellent, and the presentation is clear and simple, yet without loss in depth. Mathematical arguments are rare; instead, physical reasoning or analogies are used to interpret the phenomena of modern physics. For the most part, a modest amount of previous knowledge is required; a 1-year course in college physics should suffice.

Apparently the authors intended to

plan the book so that it advances within the increasing knowledge and experience of the reader. That may explain why the theory of relativity is presented in the very last chapter of the book, although use is made of the results of the special theory of relativity from the beginning.

The simple approach to many difficult problems that is used throughout the well-illustrated book makes it a very good text for an introductory lecture in atomic and nuclear physics. It is very well suited to the needs of students who are not majoring in physics.

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### Bergsonian Philosophy and Thomism.

Jacques Maritain. Trans. Mabelle L. Andison and J. Gordon Andison. Philosophical Library, New York, 1955. 383 pp. \$6.

This volume by the noted French philosopher Jacques Maritain comprises all of his first work *La Philosophie Bergsonienne* published originally in 1913 as well as two essays on Bergson that appeared in *Ransoming the Time* (1941). An appendix is devoted to some "Marginal notes on Aristotle" and a bibliography of Bergson's works.

The book makes available for the first time in English translation Maritain's searching critique of Bergsonian philosophy against the background of Thomist thought. The study as a whole has an especial interest for the student of modern philosophic thought who is here allowed to witness the dramatic struggle between two of the greatest philosophers of 20th-century France. The issue at stake is whether the radical empiricism of Bergson, with its emphasis on the primacy of change and time, or the "perennial philosophy" of Thomism, with its metaphysics of being and potentiality, is to prevail. Maritain, the student turned critic, is uncompromising in his critique of Bergson's philosophy of nature in the name of Thomism. The author has included his valuable preface to the second edition of *La Philosophie Bergsonienne* (1929) in which he summarizes the basic issues as he sees them in retrospect and

endeavors to give the master the homage and credit that are due him.

Maritain has wisely distinguished the "Bergsonism of fact" from the "Bergsonism of intention." He seeks to do justice to the intentions that motivated Bergson's thought in his struggles against the positivism and materialism prevalent in the France of his day, while criticizing the latter's "departures from truth" in the formulation of his own philosophy of creative evolution. Maritain's thesis is that, in order to avoid current mechanism and determinism, Bergson sacrificed the human intellect and the metaphysics of being and potentiality; that the latter confused substance and movement, making time that flows, duration, the very stuff of things; that Bergson confused freedom and contingency; and that he denied reason an authentic power of attaining the true, the so-called "truths of reason" being nothing more than pragmatically useful abstractions from the concrete, creative becoming known by intuition. Bergsonian philosophy is pictured as a kind of inverted Spinozism, which views all things under the aspect of duration rather than of eternity and changeless substance.

In *The Two Sources of Morality and Religion* (1932) Bergson incorporated much of traditional religious mysticism and recognized the unique historical value of the fact of Christianity. By distinguishing the forces of "pressure" and "attraction" and the corresponding "static" and "dynamic" forms of religion and morality as manifested in "closed" and "open" societies, Bergson found it possible to acknowledge in the name of his suprarational intuition the moral and religious ideals that the classical philosophers and theologians had derived from reason and revelation. The fact that in his will of 1937 (he died in 1941) Bergson professed an inclination toward Catholicism serves as a unique and dramatic confirmation of the validity of Maritain's original evaluation of the spiritual intentions of Bergson's philosophy.

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### Annual Reviews of Plant Physiology. vol.

6. D. I. Arnon, Ed. Annual Reviews, Stanford, California, 1955. xi + 505 pp. \$7.00.

In the ever-increasing deluge of scientific publications, no one can question the value, perhaps even the necessity, of the Annual Review series. Particularly in the field of plant physiology, where the spectrum of research reaches from classical taxonomy to esoteric biophysics, this

publication is a link that can provide a common basis for the interchange of ideas.

Because of the key role played by such a book, it is important that the contributors devote considerable effort to present their material in a stimulating as well as informative manner. It is not enough to write a running commentary on a series of bibliography file cards. Outstanding examples of good review writing are to be found in chapters on "Nitrogen metabolism" (G. Webster), "Functional aspects in mineral nutrition of green plants" (A. Pirson), and "Chemical nature of disease resistance in plants" (J. C. Walker and M. A. Stahmann). These authors have the ability to weave a presentation of the latest material into the patterns of previous knowledge. Furthermore, they are able to point out the broad as well as specific areas where future research is needed.

The other articles, all of high caliber, but lacking the sparkle that would make them outstanding, concern the following topics: mineral nutrition, photosynthesis, growth regulators, flowering, abscission, atter relationships, flower colors, cotton physiology, pathogenicity, alkaloids, and tissue culture.

It seems unfortunate that H. Lundegårdh in his review on "Mechanisms of absorption, transport, accumulation, and secretion of ions" took this opportunity to present, essentially, a defense of his own theories with references made only to those works that tend to support him. The omission of the important researches of Epstein and others gives evidence of this reluctance to present a balanced view of this subject.

D. I. Arnon is to be commended for his efforts as editor for the past 6 years. It is hoped that L. R. Blinks, as the new editor, will continue to make *Annual Review of Plant Physiology* not only an essential encyclopedic reference source, but a dynamic and stimulating publication to be enjoyed by all plant scientists.

PAUL SALTMAN

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**Polarographic Techniques.** Louis Meites. Interscience, New York-London, 1955. xiii + 317 pp. Illus. \$6.

In writing a manual to guide the student who is being introduced to the science of polarography, Meites has contributed an easily read and well-organized textbook.

A short introductory chapter on the nature and scope of polarographic measurements is followed by a description of present-day instrumentation. The polarographic limiting current is the subject of the third and longest chapter (43 pages),

which contains a discussion of the residual, migration, and diffusion currents followed by a description of the kinetic, catalytic, and adsorptive phenomena that complicate the interpretation of the magnitude of the limiting current. Eight experiments at the end of the chapter are included to illustrate the main points developed. In all, 28 such experiments are included in the book. After mastering the first three chapters and Chapter 6 on maximum suppressors, the student should be ready to proceed to the interpretation of current-voltage curves (Chapters 4 and 5), quantitative analyses (Chapter 7), amperometric titrations (Chapter 8), and the more specialized techniques of polarography (Chapter 9). One hundred and twenty-six well-chosen references are inserted to encourage the interest of the student in further study and research.

The limited usefulness of the appendix on trouble-shooting in polarographic circuits is more than over-balanced by the usefulness of the extensive table of half-wave potentials and diffusion-current constants of inorganic substances that is compiled in the second appendix.

HARRY A. SAROFF

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**Histologische Geschwulst Diagnostik.** Systematische Morphologie der menschlichen Geschwulste als Grundlage für die klinische Beurteilung. A. V. Albertini. Thieme, Stuttgart, 1955. xvi + 544 pp. Illus. \$23.40.

The book of the prominent Swiss pathologist A. V. Albertini deals with the micromorphology of benign, malignant, and borderline tumors, discusses interpretations of histological structures and prognostic evaluation, and contains remarks on relative frequency, age, and sex.

The author covers systematically and completely all kinds of tumors of the respiratory, digestive, and urinary organs; the female genitals; the breast; the male genitals; the thyroid and parathyroids; the adrenals; the sympathetic nervous system; the heart and blood vessels; tendons and bursae; spleen and lymph nodes, bones and skin. Neoplasia of each organ is grouped according to histogenesis and cell and tissue differentiation. The scheme, well executed, permits a quick and easy orientation. Some exceptions are made either because of difficulties in classification or for reasons of tradition (for example, Ewing sarcoma and Brenner tumor).

More flexible than other conservative pathologists, the author acknowledges the usefulness of cytological tumor diagnosis and recognizes the superiority of

Papanicolaou's method over other methods. Albertini is not enthusiastic about the prognostic evaluation of tumors by grading slides according to cell activity, differentiation, and mitotic index. He views this method as pseudoeexact and gives preference to Walther's formula, which empirically accounts for three variables: growth by expansion, lymphatic spread, and hematogenous dissemination. However, this procedure also has shortcomings.

Albertini thinks that the cytoplasm of cancer cells gets too little attention and advocates examination of fresh unstained tumor samples by means of Zernike's phase-contrast method. This method reveals important regressive changes, otherwise missed, within the cytoplasm and in the cell membrane (in highly dedifferentiated tumors).

In each chapter the author gives an account of unsettled problems of classification. Differences of opinion occur at the delineation of precancerous conditions from cancer, as, for instance, in Hinselmann's stages III and IV of cervix pathology. Stressing histological more than cytological features, Albertini includes preinvasive carcinoma (surface carcinoma, carcinoma *in situ*, or "carcinoid") in the group of precancers. Thus, Bowen's disease is a precancer as long—and this means many years—as the numerical equilibrium between proliferation of the cancerous cells and their disintegration has not been shaken.

Time and again the author points out difficulties arising from disagreement between histology of a tumor—appearance as a benign tumor or a granuloma—and its malignant clinical course—for example, in Kaposi's angiosarcoma, and vice versa. Thus, he classifies skin epithelioma, because of its clinical course, as a precancerous condition, despite its histology. He also discusses histological divergencies between primary epithelial tumors and seemingly sarcomatous metastases (epithelioma fusocellulare).

Albertini still excludes leukemia from the family of tumors, and since some lymphocytic lymphosarcomas (of the mediastinum) turn into leukemia, he considers those a localized form of leukemia and not members of the sarcoma group. In view of the prevailing opinion regarding leukemia, this complex deserved a more thorough discussion than a paragraph in the subchapter on *benign lymph-node tumors*.

No place was reserved for tumors of the central nervous system, the eye, and the ear. I doubt whether Cushing and Bailey's work is a valid reason for excluding them from a comprehensive book on histopathology of tumors. Omission of these tumors is the more deplorable because, in recent years, much attention has been paid to childhood cancer. I also

doubt whether Wilms' kidney tumor should be still called embryonal adenocarcinoma (Birch-Hirschfeld), and whether cortical adrenal carcinomata are "relatively frequent" in children. A comparison with the frequency of cancer arising in the tiny medulla of the very same organ (neuroblastoma) shows that they are rather rare and late.

The book has 638 excellent photographic illustrations in black and white, an index of authors and subjects, and, at the end of each chapter, references; it is concisely written and stimulating.

SIGISMUND PELLER

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#### Perinatal Mortality in New York City:

**Responsible Factors.** A study of 955 deaths by the Subcommittee on Neonatal Mortality, Committee on Public Health Relations, New York Academy of Medicine. Schuyler G. Kohl. Harvard Univ. Press, Cambridge, Mass., 1955. xxi + 111 pp. \$2.50.

In this book, whose small size belies its importance, an analysis is made of 955 perinatal deaths in the city of New York during the years 1950-51. The term *perinatal* is used to include stillbirths as well as deaths in prematurely born and mature babies.

A startling fact brought out in this study is that about a third of the perinatal deaths were preventable. The best records were made by the voluntary teaching hospitals; the poorest, by the municipal nonteaching hospitals. Responsibility for preventable deaths was shared about equally by erroneous medical judgment, unsatisfactory medical care, and erroneous medical technique. Death was more often preventable in the mature than in the premature infants.

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#### Theoretical Structural Metallurgy. A. H.

Cottrell. St. Martin's Press, New York, ed. 2, 1955. viii + 251 pp. Illus. \$4.50.

The understanding of the behavior of metals and alloys has made rapid progress in the last decade, especially with the help of the electron theory of metals, statistical thermodynamics applied to phase changes, and clearly defined descriptions of several lattice defects and the way in which they affect metallic properties. These developments have to show up in today's training of students of metallurgy. The Birmingham school, from the curriculum of which Cottrell's

book derives, is well known for its pioneering in metallurgical education.

The author tries to build up the present theoretical picture of the structure of metals from fundamental physical principles. One cannot, of course, expect here a rigorous description of the electron theory of metals. However, the essential aspects of modern theory are explained step by step. The presentation adopted should enable the reader to appreciate the current developments and consequences of the theoretical picture and perhaps even to overcome some metallurgists' horror for the theory and its terminology.

The first chapters give a wave-mechanical picture for the electronic states in atoms and for interatomic forces, together with some fundamentals on crystallography. Some difficulties are unavoidable in a qualitative review of, for example, the Heitler-London molecule that introduces exchange forces. The chapters which follow give a good idea of the quantum theory of the free electron and the electron in a periodic potential as well as some applications to conductivity, ferromagnetism, and cohesion. The thermodynamic variables and their statistical interpretation are introduced next and immediately used to study the thermal behavior of metals. Both electron theory and thermodynamics are employed in the following chapters on the structure and the free energy of alloys and an interpretation of equilibrium diagrams (including zone melting). Diffusion, the diffusion-controlled order-disorder changes and precipitation kinetics are treated in the next three chapters. The book concludes with a chapter on shear processes, a new feature of the second edition. It combines a very brief description of dislocations with a review of the martensitic transformation. Introduction of the latter after the diffusion-controlled transformations probably justifies the position of the chapter on dislocations in the book, although knowledge of dislocation properties would undoubtedly aid comprehension in many of the preceding chapters.

The second edition has been almost entirely rewritten and, in my opinion, greatly improved. Some of the statements are now less dogmatic, and only the essential features of some theories are considered. In addition, simple mathematics are now left to the reader. The number of good figures has been increased, but the total size has been decreased despite the enlarged content. The book is very well written; the last chapters in particular read like a detective story. Cottrell's book can be highly recommended to everyone interested in the physical foundations of the science of metallurgy.

PETER HAASEN

University of Chicago

**The Biology of a Marine Copepod *Calanus finmarchicus* (Gunnerus).** S. M. Marshall and A. P. Orr. Oliver & Boyd, London, 1955. vii + 188 pp. Illus. 21s.

One of the most important animals in the sea is this little arthropod, and Marshall and Orr have published so many papers about it that their names are almost synonymous with it. This book is not a simple collation of these papers, but a carefully prepared treatment of the various aspects of the biology of *Calanus finmarchicus*, beginning with systematics and distribution and proceeding through such topics as anatomy, reproduction, food, migrations, parasites, and environmental relationships.

Although this is the latest and most exhaustive word on the subject, it cannot be said to be the last word. The uncertainties and lacunae are constantly called to the reader's attention, beginning with the as yet unresolved question of whether there are two species, or two—or even three—distinct forms involved under this name. Nevertheless, this book is a splendid example of the sort of information we must have about the important animals of the sea before we can understand more completely the economy of the sea.

JOEL W. HEDGPETH

Scripps Institution of Oceanography

**Radiobiology Symposium, 1954.** Proceedings of the symposium held at Liege, Aug.-Sept., 1954. Z. M. Bacq and Peter Alexander, Eds. Academic Press, New York; Butterworths, London, 1955. xix + 362 pp. Illus. \$9.80.

The second International Symposium on Radiobiology was held at Liege, Belgium, in August and September 1954. This volume, edited by Z. M. Bacq and Peter Alexander, contains most of the papers that were presented, together with the discussions. It is of particular value to the American reader who has a general interest in the effects of ionizing radiations on biological systems because the preponderance of material is presented by outstanding European radiobiologists or representatives of their laboratories. The discussions are for the most part of a very high order and serve to highlight present-day thought on the complex mechanisms involved in the production of initial, secondary, and ultimate effects in simple chemical systems and in living organisms.

The several papers and discussions dealing with the action of protective, sparing, and restorative agents in simple and complex systems give an exceedingly full picture of present knowledge of



and experimental approaches to this very timely and practical problem. Alexander's paper summarizing his systematic studies of primary chemical effects of radiation, using certain polymers as models, is outstanding. His experimental work, using appropriate polymers with selected additives and aromatic side chains, has demonstrated the occurrence in these systems of a number of postulated mechanisms that indicate that the so-called direct effects of ionizing radiation on molecules are not necessarily inevitable, but may be subject to a variety of modifying factors.

For those who are especially interested in minimizing the effects of whole-body radiation in mammals, there are several papers on the subject with lively discussions by Bacq, Patt, Mogat, Alexander, and others. The reader interested in enhancing radiation effects on tumors will be fascinated by Mitchell's report of his extensive studies with radiosensitizers.

In the field of genetics, there are five papers with discussions dealing with the mechanisms involved in chromosome breaks and rearrangements. In addition, there are interesting papers dealing with the effects of physiologic state, ion density, types of ionizing radiation, and post-irradiation factors on the number and nature of the surviving mutants.

There are also a number of papers dealing with the effects of ionizing radiation on a variety of biochemical compounds and enzyme systems.

In short, this volume, although it is not calculated to give complete coverage to the entire field of radiobiology, does include a large amount of first-rate material dealing with certain very active areas of research.

C. L. DUNHAM

U.S. Atomic Energy Commission

## Books Reviewed in The Scientific Monthly

### December

*The Facts of Life*, C. D. Darlington (Macmillan). Reviewed by H. P. Papazian.

*Man on Earth*, J. Hawkes (Cressent). Reviewed by J. D. Lovell.

*The Equatorie of the Planetis*, D. J. Price, Ed. (Cambridge Univ. Press). Reviewed by G. M. Smith.

*Pomp and Pestilence*, R. Hare (Philosophical Library). Reviewed by M. H. Adams.

*Apes, Angels, and Victorians*, W. Irvine (McGraw-Hill). Reviewed by G. Hardin.

*Human Physiology*, W. B. Youmans (Macmillan). Reviewed by F. A. Hitchcock.

*Cells and Societies*, J. T. Bonner (Princeton Univ. Press). Reviewed by C. R. Carpenter.

*Bird Recognition 3*, J. Fisher (Penguin Books). Reviewed by W. H. Drury, Jr.

*Plane Trigonometry*, C. R. Wylie, Jr. (McGraw-Hill). Reviewed by L. M. Kells.

*School Facilities for Science Instruction*, J. S. Richardson, Ed. (National Science Teachers Assoc.).

*Studies in Mathematics and Mechanics*, Presented to Richard von Mises by friends, colleagues, and pupils (Academic Press). Reviewed by A. Rosenthal.

*Astronomy*, R. H. Baker (Van Nostrand). Reviewed by A. P. Linnell.

*Introductory Applied Physics*, N. C. Harris and E. M. M. Hemmerling (McGraw-Hill). Reviewed by M. W. White.

*Sir Isaac Newton*, E. N. daC. Andrade (Collins).

*Minnesota's Rocks and Waters*, G. M. Schwartz and G. A. Thiel (Univ. of Minnesota Press).

*Ferns of Tennessee*, J. M. Shaver (George Peabody College for Teachers). Reviewed by C. V. Morton.

*The Encyclopedia of Child Care and Guidance*, S. Matsner Gruenberg, Ed. (Doubleday).

*Educators Guide to Free Films*, M. F. Horkheimer and J. W. Diffor (Educators Progress Service).

*Mammals*, H. S. Zim and D. F. Hoffmeister (Simon and Schuster).

*Plant Life in Malaya*, R. E. Holtum (Longmans, Green).

*Your Career in Physics*, P. Pollack (Dutton). Reviewed by J. S. Coleman.

*Plants without Flowers*, H. Bastin (Philosophical Library). Reviewed by G. M. Smith.

## Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, but to the publisher or agency sponsoring the publication.)

*Clinical Testing of Dental Caries Preventives*. Report of a conference to develop uniform standards and procedures in clinical studies of dental caries. American Dental Assoc., Chicago, 1955. 67 pp. Single copy, free.

*Alfred P. Sloan Foundation, Report for the Year, 1953-1954*. The Foundation, New York 20, 1955. 127 pp.

*International Scientific Radio Union, Proceedings of the XIth General Assembly*. vol. X, pt. 3. Commission III on Ionospheric Radio. The Union, Brussels, 1955. 194 pp. \$4.

*Oak Ridge Institute of Nuclear Studies, Ninth Annual Report*. 30 June 1955. Atomic Energy Commission, Oak Ridge, Tenn., 1955. 72 pp.

*Illinois Trees: Their Diseases*. Circular 46. J. Cedric Carter. Illinois Natural History Survey Div., Urbana, 1955. 99 pp. Single copy, free.

*Physical-Chemical Properties of Ethane-Nitrogen Mixtures*. Research Bull. 26. B. E. Eakin, R. T. Ellington, and D. C. Gami. Inst. of Gas Technology, Chicago 6, Ill., 1955. \$5.

*The American Museum of Natural History, Eighty-Sixth Annual Report, July 1954 through June 1955*. The Museum, New York, 1955. 84 pp.

*The American Species of Aeschynomene*. Contributions from the U.S. National Herbarium. vol. 32, pt. 1. Smithsonian Institution, Washington, 1955 (Order from Supt. of Documents, GPO, Washington 25), 172 pp. \$0.75.

*Strengths and Weaknesses of the Junior High Schools*. Report of the National Conference on Junior High Schools, Washington, D.C., 25-26 February 1955. Circular No. 441. Compiled by Walter H. Gaumnitz. U.S. Office of Education, Washington, 1955 (Order from Supt. of Documents, GPO, Washington 25). 56 pp. \$0.40.

*Life and Death of the Soil*. Robert C. Sherman. Science Research Associates, Chicago 10, 1955. 48 pp. \$0.60.

*Making the Years Count*. New York State Joint Legislative Committee on Problems of the Aging. The Committee, 1955. 162 pp. Single copy, free (Send request to Thomas C. Desmond, Chairman, 94 Broadway, Newburgh, N.Y.).

*The Writings of David Barnard Steinman Relating to the Design, Construction and History of Bridges, Including Contributions to the Development of the Engineering Profession, 1909-1954*. A bibliography. Engineering and Science Ser., No. 67. Library staff. Rensselaer Polytechnic Institute, Troy, N.Y., 1955. 28 pp.

*Conference on the Plasma Proteins and Cellular Elements of the Blood*. 15 November 1954. Protein Foundation, Inc., and Commission on Plasma Fractionation and Related Processes, Cambridge 38, Mass., 1955. 76 pp.

*An Engineering Pilot Study to Determine the Comparative Injury Potential of Steering Wheel Assembly Designs (Automotive)*. Sections I-III. Andrew J. White. Motor Vehicle Research, Inc., South Lee, N.H., 1955. 23 pp.

*Educational Directory, 1954-55*. pt. 1, Federal Government and States. U.S. Office of Education, Washington, 1955 (Order from Supt. of Documents, GPO, Washington 25). 56 pp. \$0.25.

*Planning Florida's Health Leadership: Medical Education in the University*. vol. 5, Medical Center Study Ser. Louis J. Maloff, Ed. Univ. of Florida Press, Gainesville, 1955. 161 pp. \$1.50.

*On the Dynamics of Wind-Driven Ocean Currents*. vol. 2, No. 4, Meteorological Papers. Gerhard Neumann. New York Univ. Press, New York, 1955. 32 pp.

*Longitudinal Study of Individual Development*. Techniques for appraising developmental status and progress. Leland H. Stott. Merrill-Palmer School, Detroit, Mich., 1955. 115 pp. \$2.75.

*Baccalaureate Origins of Science Doctorates Awarded in the United States, 1936-1950*. Publ. 382. National Acad. of Science-National Research Council, Washington 25, 1955. 158 pp. \$2.

*Ninetyth Annual Report of the Surgeon General, U.S. Navy, to the Secretary of the Navy*. Relative to statistics of diseases and injuries in the U.S. Navy for the calendar year 1954. Government Printing Office, Washington, 1955. 183 pp.

*The Story of Cosmic Rays*. W. F. G. Swann. Sky Publishing, Cambridge, Mass., 1955.

## Scientific Meetings

### Biometric Techniques in Biology

An international symposium on "The role of biometric techniques in biological research" met in Campinas, Brazil, 4-9 July. The Biometric Society, which forms the Biometric Section of the International Union of Biological Sciences, sponsored the symposium; an organization committee under the chairmanship of W. G. Cochran planned the program; the Seminario de Estatística da Universidade de São Paulo, of which C. G. Fraga is secretary, handled local arrangements; and the University of São Paulo was host. Registration totaled 98, with 62 from Brazil, 8 from other Latin American countries, 14 from the United States, 12 from Europe and the United Kingdom, and 1 each from India and Japan.

Following an address of welcome by R. Cruz Martins, secretary of agriculture for the State of São Paulo, the scientific program opened with the presidential address by W. G. Cochran (Johns Hopkins) on the 1954 poliomyelitis trial of the Salk vaccine in the United States. Cochran compared the relative incidence of paralytic poliomyelitis among second-grade children in the placebo areas, where those receiving the vaccine were matched by controls receiving a similar injection of a placebo, with the results in observed areas where the controls were not inoculated but attended the same schools in the first and third grades. The vaccinated children showed nearly the same case rate in both types of area. The case rate was higher in the placebo children, however, than it was among the controls in the observed areas, a difference that he attributed to more hygienic home surroundings and hence a lower natural immunity among the placebo children, where the parents' consent was required, than there were in the observed areas, where this was a selective factor in the vaccinated children but not in their controls.

The afternoon program offered four papers on biometrical genetics. In the first, on the role of biometrics in plant improvement, Ronald A. Fisher (Cambridge) listed the contributions of biometrics under three headings: (i) experimental design, especially the art of

carrying out field trials with accuracy, (ii) biometrical genetics in the sense of K. Mather, in which large numbers of Mendelian factors are involved that cannot be displayed individually, and (iii) biometrical applications to classical Mendelian genetics. The second paper, by B. R. Dempster (California), concerned the use of genetic models in relation to animal breeding. F. G. Brieger (Piracicaba) discussed the behavior in plant genetics of autogamic populations and heterotic genes, proposing a model for the proportions in panmictic and in autogamic populations of neutral, recessive subviable, and heterotic genes. The concluding paper by H. Kalmus concerned some genetical consequences of cyclo-morphosis.

Experimental design was the subject of both sessions on 5 July. The opening paper by S. C. Pearce (East Malling) concerned the design of experiments on perennial crops, where adequate replication is impossible. This lack can be partially balanced by recording many concomitant measures and studying their interrelationships. In experiments on tree crops that are shorter in duration than the life of the tree, later treatments must be balanced in reference to earlier ones. In the nursery, variations may arise from so many different sources, genetic and positional, and may be so influenced by biennial bearing habits, the species, and locality that only the simplest designs are manageable. Pearce's review of general principles was followed by three reports on how these problems have been handled in Brazil—one by E. Amaral on the estimation of missing plots in experiments on sugar cane, one by A. Conagin on the design and analysis of coffee experiments, and one by F. Pimentel Gomes on perennial crops involving graded levels of fertilizers.

The discussion of experimental design continued with a review by G. M. Cox (North Carolina) of recent advances, with particular reference to estimating the response to rates of application and the use of change-over trials, incomplete block designs with double and partial balance, and paired rotatable designs. In the closing paper, W. J. Youden (National Bureau of Standards, U.S.) described

how designs developed initially by biologists have been adapted for physical experiments; in cases in which the block size was determined by the apparatus, there were two or fewer replications, the experiment was to be performed in sections, treatments were shifted in mid-course, and instrumental drift was a factor. As illustrations, he described chain-block and linked-block designs and an application to the calibration of thermometers.

The following day the symposium moved to Piracicaba for a panel discussion on experimental designs at the Agricultural College and excursions in the neighborhood; it reassembled on 7 July at Campinas for a morning program on the statistics of animal feeding experiments. In his opening paper, P. G. Homeyer (Iowa State) considered the technique and the sources of variation in experiments with chicks, Holstein cattle, and hogs, comparing the efficiency of different designs and the variance components associated with pens with outcome groups and other factors. G. L. Rocha then described experiments with pastures in the State of São Paulo and G. L. Mott (Indiana) discussed the grazing trial for measuring the output of pastures. The concluding paper by A. Linder (Geneva) described an experiment in Switzerland in which the grazing of two cows was timed on each of six differently treated plots, all freely accessible to each cow. The more nearly complete the fertilizer, the longer the cows grazed on the herbage.

The afternoon program on sampling techniques opened with a paper by M. H. Hansen (U.S. Bureau of the Census) on controlling the response errors in surveys, which may arise in the definition of the problem, in the sampling, in the conduct of the field interview, and in the handling of the data. Sampling techniques for estimating the catch of sea fish in India was the subject of the next paper by P. V. Sukhatme (FAO). Following a report by J. Nieto de Pascual on the national morbidity survey in Mexico, W. L. Stevens (São Paulo) described a collaborative project on the sampling of coffee for forecasting harvests, with special reference to the complications imposed by the 2-year cyclic character of coffee yields. In the concluding paper, Enrique Cansado (CIEF, Santiago) reviewed the mathematics of probability sampling from a finite population.

On the morning of 8 July, the Instituto Agronomico of the State of São Paulo was host to the symposium at its experiment station, the oldest agricultural experiment station in Latin America. In the afternoon, a session on bioassay opened with a paper by C. I. Bliss (Connecticut Agricultural Experiment Station) on confidence intervals for

measuring the precision of bioassays, with illustrations from the *U.S. Pharmacopoeia XV*. In the following paper, D. J. Finney (Aberdeen) developed five different models for crossover and single-subject assays with two dosage levels of the standard and two of an unknown. The author considered possible correlations between components of residual error, residual effects of past doses, and the influence of one response on its successors in assays on a single test subject. P. Mello Freire (Instituto Biológico, São Paulo) then described a bioassay for complement fixation with two doses each of the standard and of the unknown in three replicate tests. A panel discussion closed the session. Later, members of the Biometric Society in Brazil completed the formation of a Brazilian Region of the society.

The symposium closed on the morning of 9 July with a session on medical statistics. The opening paper by J. O. Irwin (London School of Hygiene and Tropical Medicine) on the physiological effects of hot climate concerned an experiment by a tropical research unit in Singapore on the 4-hour sweat rate as modified by air movement, temperature, clothing, humidity, and other factors. J. A. Manceau (Belém, Brazil) then described a comparative study of two anthelmintics on 74 children, all infected with nematode parasites. Two drugs, hexylresorcinol and Aralen, were compared on the basis of the number of nematode eggs per centigram of feces after treatment; adjustment was made by covariance for variations in the numbers before treatment in the same individuals. The following paper by A. E. Brandt concerned the design of a clinical comparison of cobalt-60 therapy (1.3 Mev) and 22-Mev betatron therapy in the treatment of cancer. Brandt described the problems that arose in assigning patients at random to the two treatments within the limits imposed by medical ethics and how the conditions essential for a controlled experiment led to its restriction to squamous cell carcinoma of the cervix. The final speaker in the symposium was A. Vessereau, who reported an application of the discriminant function for differentiating medical cases of hepatitis from surgical cases of calculus or cancer by an electrophoretic analysis of the serum proteins.

Following the adoption of resolutions thanking the hosts, the symposium adjourned. Members who were able to remain visited a dairy and coffee farm in the afternoon. The proceedings of the symposium, abstracts, and a number of the papers will appear in forthcoming issues of *Biometrics*.

C. I. BLISS

New Haven, Connecticut

## Physiological Triggers

The tenth annual meeting of the Society of General Physiologists was held at the Marine Biological Laboratory, Woods Hole, Mass., 9-10 September. The 208 registrants and participants included members of the American Physiological Society, which met earlier in Medford. The first day was devoted to short research papers and the business meeting and the second to an extensive symposium on "Physiological triggers," arranged by Theodore H. Bullock.

The symposium on "Physiological triggers" described many instances in the plant and animal world of mechanisms designed for the rapid liberation or utilization of stored energy reserves in response to suitable conditions. The following summary of the papers was kindly submitted by the organizing chairman, T. H. Bullock.

Recent findings on the process of infection by tobacco mosaic virus were described by Irving Rappaport. These indicate that one particle may initiate this process and that the replicating unit may differ from the *in vitro* rods. Lawrence Blinks illustrated striking cases of chemical, electric, and light trigger action in unicellular plants.

The discovery of a new substance, *kinetin* (6-furfurylaminopurine), which is required for cell division, was reported by Folke Skoog. It permits continuous growth of various higher plant tissues *in vitro* and acts in concentrations down to 1 microgram per liter.

The evidence and theories for control of luminescence, especially in fireflies, were summarized by W. D. McElroy. These lead to a picture of pyrophosphate release by nerve impulses that splits the complex of oxygenated intermediate and protein, in particular inorganic pyrophosphatase, thereby producing the flash.

C. B. Metz reviewed current knowledge of mechanisms in fertilization, including the dependence of the mating reaction and nuclear cycle of paramecium conjugation on the interaction of specific, superficial, mating-type substances. The striking requirement of a "fertilization" of the spermatozoan before it can participate in fertilization of the egg was also documented.

The shifts in metabolic pattern under hormonal and environmental controls at the onset and termination of diapause in insect development were described by Howard Schneiderman. The diapausing pupa loses the cytochrome *c* oxidase system present in both larva and adult. Cold renders the neurosecretory cells of the brain competent to produce a substance terminating diapause; this synthesis requires oxidative metabolism but not cytochrome *c* oxidase.

Excitable tissues were represented by three contributions. The distinction between electrically excitable and electrically inexcitable stages in the response of the postjunctional membrane of cells was emphasized by Harry Grundfest. Attention was drawn to the differences between the inner and outer faces of excitable membranes. Thus, a large alteration in internal  $K^+$  by microinjection may not affect the resting potential. The reality of graded responses as large and brief as spikes but propagated decrementally was demonstrated in several cases. Hallowell Davis analyzed the evidence for and the difficulties facing his theory of initiation of cochlear nerve impulses, and E. G. Boettiger presented tension-length diagrams of passive and active insect fibrillar muscle during myogenic rhythms of high-frequency contraction in which the nerve impulse is necessary several times per second but does not determine the frequency.

The last two papers concerned endocrine mechanisms, first at the level of the primary mechanisms of action on target cells (Clara M. Szego) and then at the level of the central nervous concomitants of the triggering of the pituitary in phasic events such as ovulation (C. H. Sawyer). Szego distinguished a small number of primary loci from the large variety of biochemical reactions that are influenced, especially in reproductive target organs, by steroid hormones. The primary trigger seems to be a competitive binding of hormone to receptor proteins at the cell surface that acts to alter permeability selectively. Sawyer has been able to delimit the sites of electric activity involved in ovulation by suitable recording under conditions of stimulation and damage of the central nervous system with and without the aid of neuropharmacological agents. Estrogen facilitates the neurogenic activity. Blocking drugs reveal that the pituitary activation in the rat takes 20 to 35 minutes during a critical period between 2 and 4 P.M. on the day of proestrus and is accompanied by characteristic electric events in the lateral preoptic region.

At the business meeting the council reported its decision to hold the 1956 meeting with the AIBS at Storrs, Conn., and its approval of the new AIBS constitution. It also recommended institution of honorary memberships for those who have retired and several constitutional changes, the chief of which were separation of the duties of the secretary and treasurer and restriction of the vote on prospective new members to those attending the annual meeting. The following announcements were made: (i) abstracts of papers given at annual meetings are appearing regularly as a supplement of the *Journal of Cellular and*



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*Comparative Physiology*—the October 1954 issue of the journal contained the first such supplement; (ii) last year's symposium, "Electrolytes in biological systems," organized and edited by A. M. Shanes, was recently published by the American Physiological Society; (iii) names of officers and councilors who were elected by mail balloting.

This year's symposium will be published as a monograph similar to the volume based on last year's session.

ABRAHAM M. SHANES

*National Institutes of Health,  
Bethesda, Maryland*

## Meeting Notes

■ The fourth annual meeting of the American Society of Tropical Medicine and Hygiene was held at the Somerset Hotel in Boston, Mass., 2-5 Nov. Sixty-two papers were presented. Included among these were seven dealing with a symposium on "Newer knowledge of viral and rickettsial diseases," which was moderated by E. H. Lennette, California State Department of Public Health, Berkeley.

The 20th annual Charles Franklin Craig lecture on "The confusing epidemiology of malaria in California" was delivered by Harold F. Gray of Oroville, Calif. William H. Taliaferro of the University of Chicago presented as his presidential address "The functions of the spleen in immunity."

■ At the conclusion of a 3-day scientific meeting last month of leaders in Air Force psychological research, the chairman of the meeting, Harry F. Harlow, said "I believe the high quality of fundamental research reported shows the Air Force has a well-rounded scientific program designed to improve the efficiency of the human component in the Air Force mission." Harlow, Comstock research professor at the University of Wisconsin, added "This has been the first time in many years that people from all phases of Air Force research programs—from recruit classification to survival training—have been gathered in one meeting."

The meeting, which took place at the National Academy of Sciences—National Research Council, 14-16 Nov., was arranged by the NAS-NRC Division of Anthropology and Psychology, at the request of the Air Research and Development Command. Harlow is chairman of this division and was chairman of the meeting, which was attended by approximately 150 persons.

Detlev Bronk, president of the academy, opened the sessions with a review of the relationship to one another of the sciences, the academy, and military research. He reminded his audience that

the academy was originally formed in Civil War days, at the request of President Lincoln, in order to coordinate scientific information useful to the Federal war effort.

The research papers presented were grouped under three topics—training, personnel research, and human engineering; and Harlow pointed out that "Significant advances were reported from Air Force laboratories in all three fields, showing continued recognition by the military that the human component is a critical and often the key factor in modern weapons systems."

In presiding over a session of the symposium, Leonard Carmichael, secretary of the Smithsonian Institution, said "A meeting of this kind to me exemplifies the growing interchange of information between the various sciences and the research programs of the Government. . . . To produce a forum of this sort where new ideas are exchanged seems to me exactly the purpose for which the academy was founded."

A study of the effects of loss of sleep on the ability of Air Force officers to perform a complex mental task was presented by Walter D. Chiles of the Aero Medical Laboratory, Wright Air Development Center, Dayton, Ohio. Six subjects were deprived of 30 hours' sleep and then confronted with a complicated task. Persons who had had a normal amount of sleep learned this task fairly rapidly, but those who had been sleepless showed marked decreases in learning ability.

Raymond J. Christman, of the Human Factor Laboratory, Rome Air Development Center, Rome, N.Y., reported on basic measurements of the way in which a person judges the direction from which a sound is coming. Christman's experiments detailed the nature of the time difference in sound arrival between one ear and the other and the size of the difference in loudness.

Walter R. Borg and Michael A. Zaccaria of the Lackland Air Force Base, San Antonio, Tex., reported on tests that are helpful in predicting which men will make good recruiters for the Air Force. They reported that persons who test high on participation in civic affairs, gregariousness, initiative, and so forth, later turned out to be good salesmen for the Air Force.

W. J. White and M. B. Riley of the Aero Medical Laboratory discussed the effect of G on pilots' ability to read airplane control dials under various conditions of cockpit illumination. White and Riley tested men in a human centrifuge at Wright Field. They found the effect of increased G "as being equivalent to putting an optical filter before the subjects' eyes." Changes in blood circulation and an actual downward pull on the lens of the eye were given as factors in the dimming of vision under increased G.

Techniques for studying individual and group adaptations in survival conditions, as when a crew is forced down or is escaping from an enemy prison camp, were described by E. Paul Torrance of the Air Force Personnel and Training Research Center, Stead Air Force Base, Nev. Based on interviews with escapees, in which psychological analysis was made of the events which happened and the personality change or lack of change of the men involved, Torrance said he believed such extreme experiences could be studied by certain techniques, so that useful information could be given to Air Force personnel who might some day face crash landings in a jungle or hazardous escape journeys from enemy territory.

## Society Elections

■ American Society of Tropical Medicine and Hygiene: pres., Asa C. Chandler; pres.-elect, Justin M. Andrews, U.S. Public Health Service, Washington, D.C.; v. pres., Willard H. Wright, National Institutes of Health, Bethesda, Md.; sec.-treas., John E. Larsh, Jr., University of North Carolina.

■ Institute of Radio Engineers: pres., Arthur V. Loughren, Hazeltine Corp.; v. pres., Herre Rinia, Philips Research Laboratories, Eindhoven, Netherlands.

■ Potato Association of America: pres., C. W. Frutchey, Colorado A. & M. College; v. pres., R. W. Hougas; sec., W. J. Hooker, Michigan State University; treas., J. C. Campbell.

■ American Astronautical Federation: pres., John Burton, North American Aviation, Inc., Los Angeles, Calif.; v. pres., Wayne Proell, Chicago; sec., Rinehart S. Potts, 210 E. Courtland St., Philadelphia 20, Pa.; treas., James C. Keith, Massachusetts Institute of Technology.

■ American Dairy Science Association: pres., I. A. Gould; v. pres., C. F. Huffman; sec.-treas., H. F. Judkins, 32 Ridgeway Circle, White Plains, N.Y. Representative to the AAAS Council is George H. Wise.

## Forthcoming Events

### December

28-30. American Economic Assoc., New York, N.Y. (J. W. Bell, Northwestern Univ., Evanston, Ill.)

28-30. American Historical Assoc., Washington, D.C. (B. C. Shafer, Study Room 274, Library of Congress Annex, Washington 25.)

28-30. American Philological Assoc., Chicago, Ill. (J. P. MacKendrick, Bascom Hall, Univ. of Wisconsin, Madison 6.)

# **Experimental Design: Theory and Application**

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Presenting subject matter and techniques currently unavailable in other texts, Professor Federer discusses thoroughly and comprehensively the advantages, disadvantages, experimental lay-out and analysis of various types of design. In most cases, a numerical example and variations in the basic design are included, along with a list of problems and citations to numerous examples of the design.

*Published in the Late Fall*

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28-30. American Philosophical Assoc., Eastern Div., Boston, Mass. (W. H. Hay, Dept. of Philosophy, Univ. of Wisconsin, Madison.)

28-30. American Physical Soc., winter meeting, Los Angeles, Calif. (K. K. Darrow, Columbia Univ., New York 27.)

28-30. Econometric Soc., New York, N.Y. (R. Ruggles, Box 1264, Yale Station, Yale Univ., New Haven, Conn.)

28-30. Low Temperature Physics and Chemistry, Baton Rouge, La. (J. G. Daunt, Dept. of Physics, Ohio State Univ., Columbus 10.)

28-30. Western Soc. of Naturalists, Davis, Calif. (D. Davenport, Univ. of California, Santa Barbara.)

29. Metric Assoc., Inc., annual, Washington, D.C. (V. G. Shinkle, 1916 Eye St., NW, Washington 6.)

29-30. American Folklore Soc., Washington, D.C. (M. Leach, Bennett Hall, Univ. of Pennsylvania, Philadelphia 4.)

29-30. History of Science Soc., Washington, D.C. (T. S. Kuhn, 74 Buckingham St., Cambridge 38, Mass.)

30. Mathematical Assoc. of America, 39th annual, Houston, Tex. (H. M. Gehman, Univ. of Buffalo, Buffalo 14, N.Y.)

### January

9-10. National Symposium on Reliability and Quality Control in Electronics, 2nd, Washington, D.C. (J. W. Greer, Bureau of Ships, Navy Dept. Code 815, Washington 25.)

9-10. Operations Research Soc. of America, 8th national, Ottawa, Ont., Canada. (J. Abrams, Dept. of National Defense, Ottawa.)

9-14. Pan American Cong. of Ophthalmology, 5th, Santiago, Chile. (T. D. Allen, 575 Lincoln St., Winnetka, Ill.)

10. American Ethnological Soc., New York, N. Y. (A. G. James, 695 Park Ave., New York 21.)

10-11. Calcium and Phosphorous Metabolism in Man and Animals with Special Reference to Pregnancy and Lactation, New York, N.Y. (R. R. Marshak, Craigie Hill Rd., Springfield, Vt.)

12. American Genetic Assoc., Washington, D.C. (S. L. Emsweller, Plant Industry Sta., Beltsville, Md.)

12-14. Use of Isotopes in Agriculture, East Lansing, Mich. (E. W. Phelan, Argonne National Lab., Lemont, Ill.)

16-18. Documentation Conf., Cleveland, Ohio. (J. H. Shera, School of Library Science, Western Reserve Univ., Cleveland 6.)

17-20. American Pomological Soc., Rochester, N.Y. (R. B. Tukey, Horticulture Dept., Purdue Univ., Lafayette, Ind.)

20-27. Pan American Cong. of Gastro-Enterology, 5th, Havana, Cuba. (N. M. Stapler, 1267 J. E. Uriburu, Buenos Aires, Argentina.)

23-26. American Soc. of Heating and Air-Conditioning Engineers, Cincinnati, Ohio. (A. V. Hutchinson, ASHAE, 62 Worth St., New York 13.)

23-27. Inst. of Aeronautical Sciences,

New York, N.Y. (S. P. Johnston, IAS, 2 E. 64 St., New York 21.)

26-27. Western Spectroscopy Assoc. 3rd annual, Berkeley, Calif. (J. W. Otvos, Shell Development Co., Emeryville, Calif.)

30-1. International Conf. on Fatigue in Aircraft Structures, New York, N.Y. (A. M. Freudenthal, 716 Engineering, Columbia Univ., New York 27.)

30-3. American Inst. of Electrical Engineers, New York, N.Y. (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

31-3. American Soc. of Sugar Beet Technologists, 9th biennial conf., San Francisco, Calif. (Western Beet Sugar Producers, Inc., 461 Market St., San Francisco 5.)

31-4. American Physical Soc., New York, N.Y. (K. K. Darrow, Columbia Univ., New York 27.)

### February

1-2. Armour Research Foundation Mid-west Welding Conf., Chicago, Ill. (H. Schwartzbart, Armour Research Foundation, Illinois Inst. of Technology, Chicago.)

1-3. Case Studies in Operations Research, Cleveland, Ohio. (Operations Research Group, Dept. of Engineering Administration, Case Inst. of Technology, 10900 Euclid Ave., Cleveland 6.)

2-3. National Symposium on Microwave Techniques, Philadelphia, Pa. (S. M. King, Inst. of Radio Engineers, 1 E. 79 St., New York 21.)

(See 18 Nov. issue for comprehensive list)

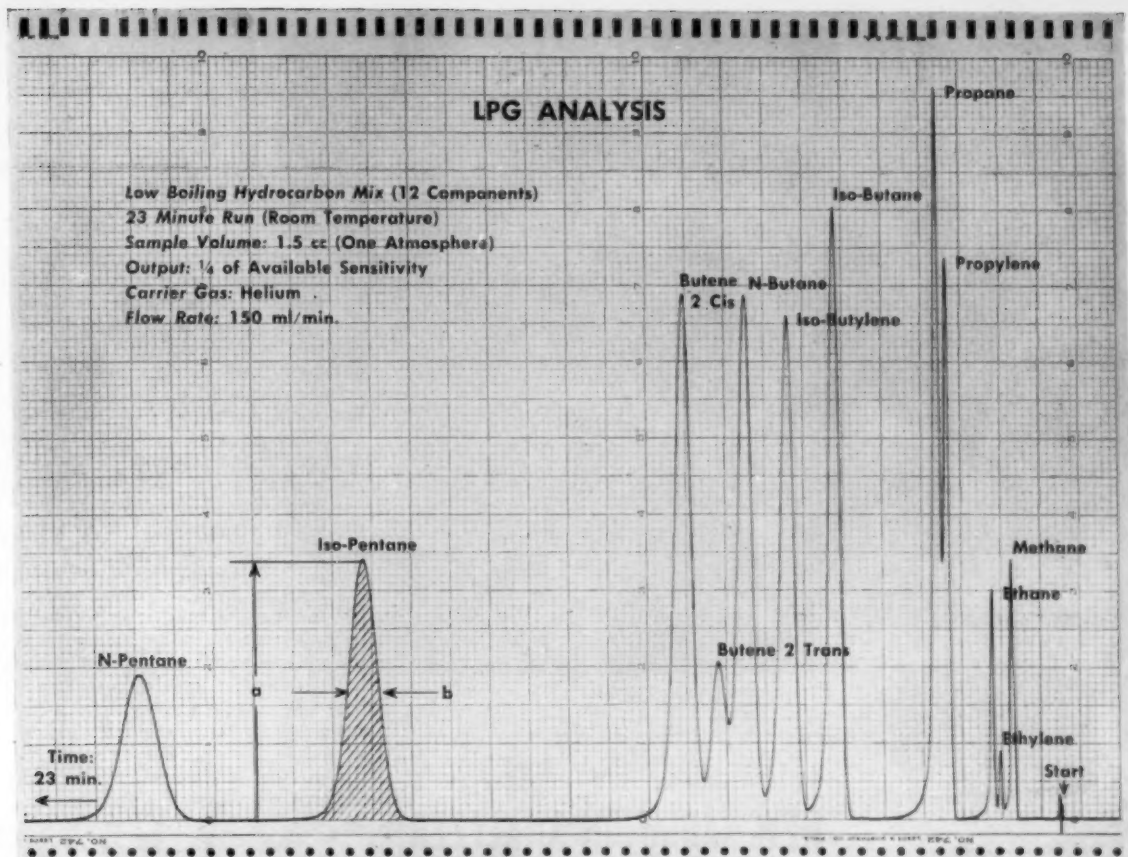


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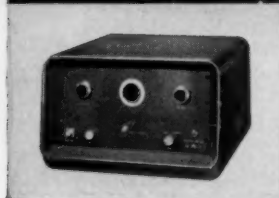
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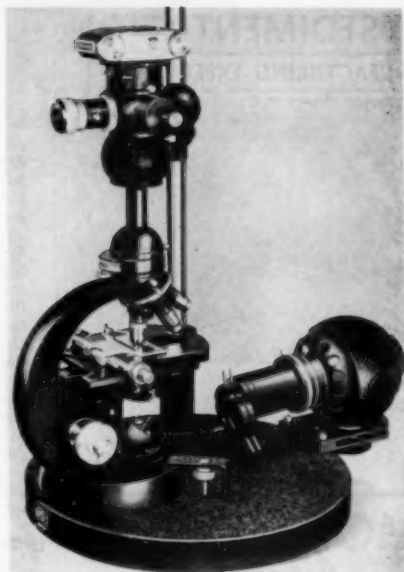
■ **MULTI-PURPOSE BATHS** are mechanically refrigerated and heated. They have a self-contained circulation system and provide both outside and inside circulation simultaneously. Temperature sensitivity is  $\pm 0.02^\circ\text{C}$ ; no coils are mounted in the cabinet. Bulletin 755. (Forma-Scientific, Inc., Dept. Sci., Box 332, Marietta, Ohio)

■ **MOLYBDENUM CATALYSTS** are described in a 24-page booklet, "Molybdenum catalysts for industrial processes," that was recently published by Climax Molybdenum Company. Reactions that research and pilot plant work indicate may be advantageously catalyzed by molybdenum compounds, as well as commercial processes using molybdenum catalysts, are reviewed in the booklet. The commercial reactions include oxidation, hydrogenation, dehydrogenation, isomerization, cyclization, chlorination, and condensation. Those not yet on a production basis include dehydration, polymerization and alkylation. In addition to a discussion of each type of reaction, the booklet contains a table of typical reactions and conditions, and one section is devoted to the factors that must be considered in choosing a specific molybdenum catalyst. Copies are available. (Climax Molybdenum Co., Dept. L, Sci., 500 Fifth Ave., New York 36.)

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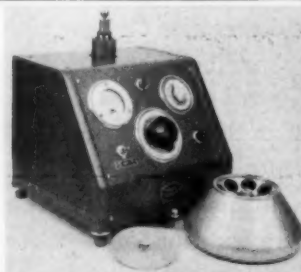
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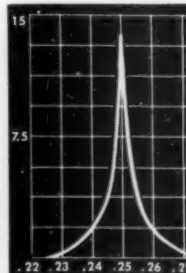
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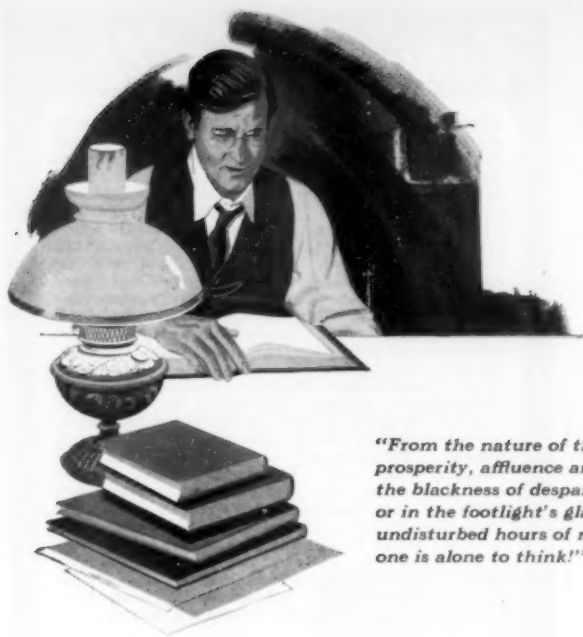
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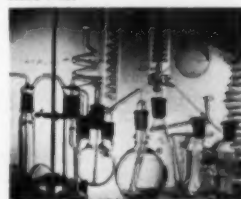
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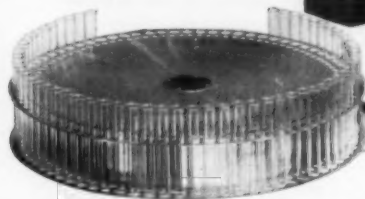
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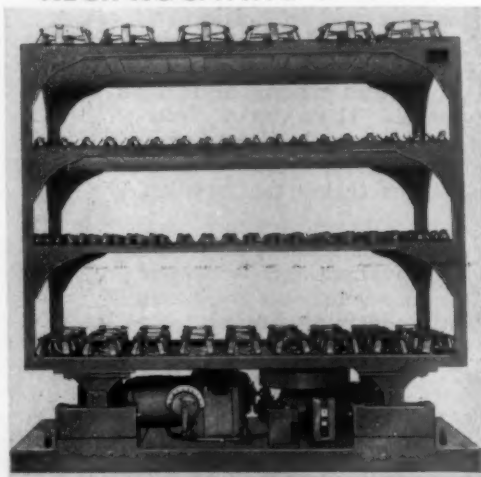
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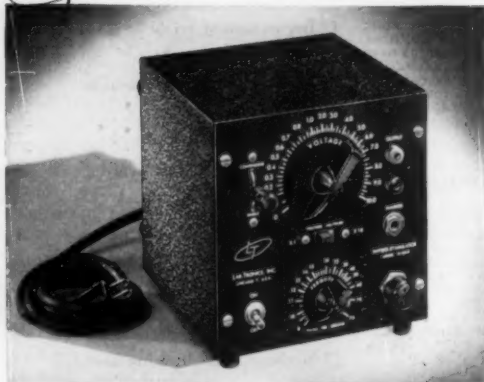
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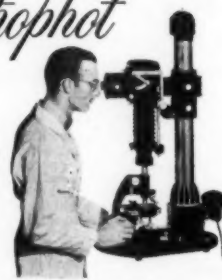
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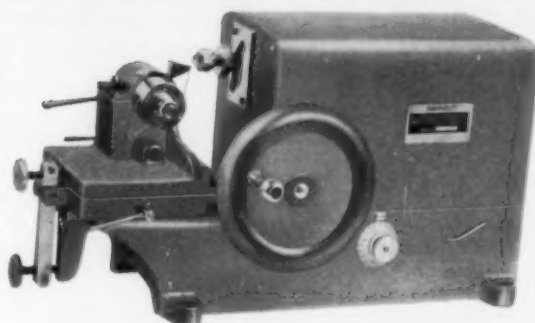
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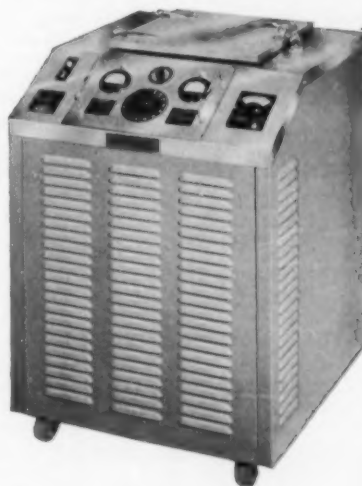
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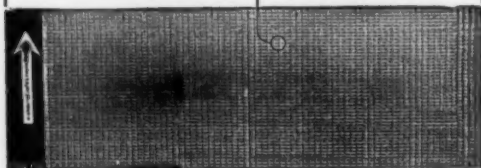
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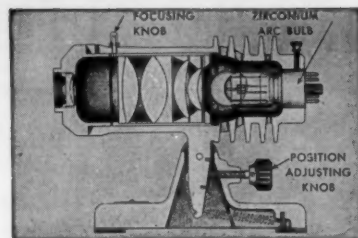
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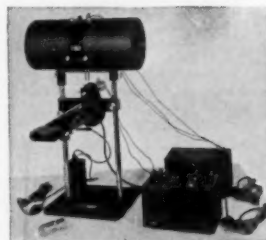
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